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John D. Mizelle, *Editor*

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A Contribution to Our Knowledge of the Wild and Cultivated Flora of Chiapas — I. Districts Soconusco and Mariscal

Eizi Matuda

Matuda Herbarium, Tacubaya, D. F., Mexico

Plant collections were made in Chiapas, the southeasternmost state of Mexico, by A. Griesbreght, E. W. Nelson, E. A. Goldman, C. & R. Seler, C. A. Purpus, G. N. Collins, C. B. Cyle, Linden and T. MacDougal during the latter part of the 19th and the first part of the present century (except MacDougal). Subsequently, Chiapas plants have been neglected by professional botanists because of social disorder and poor means of communication and travel in this state.

The present contribution is a report of Chiapas phanerogamic plants and ferns of the districts of Soconusco and Mariscal. The collections on which it is based, were made by the author from 1936 to the present, at his personal expense and without any official auspice. Moreover it comprises a preliminary report which is the first in a series of publications by the writer which will eventually culminate in a "Flora of Chiapas"—the lifelong ambition of the author.

The collection treated herein represents 166 families, 1033 genera and 2628 species and varieties. Among them one family, one genus and 55 species are new to Mexican flora. Actually, the Soconusco and Mariscal regions contain 205 species characteristic of the type locality. Most of the specimens herein cited were identified by Dr. C. L. Lundell and Dr. P. C. Standley—only a relative few were identified by the writer. Many specimens were submitted to specialists (directly or indirectly) for determination. I wish to extend formal thanks for this valuable service to Dr. H. N. Moldenke, the late Dr. W. R. Maxon, Dr. Carl Epling, Dr. Charles Schweinfurth, Dr. C. V. Morton, Dr. R. E. Woodson, Jr., Dr. L. B. Smith, Dr. S. F. Blake, Dr. C. E. Kobuski, Dr. H. A. Gleason, Dr. W. H. Camp, Dr. C. H. Muller, Dr. J. E. Swallen, Dr. E. P. Killip, Dr. C. K. Allen and Dr. I. M. Johnston.

The sequence of families followed in this paper is that of the Engler-Gilg, Engler-Diels system with slight modification by the writer. The monocotyledons are placed after the dicotyledons. The enumeration of the sheets is based on the specimens in the Matuda herbarium; the collection numbers cited, therefore, are those of the E. Matuda collection. One set of the present collec-

tion is deposited in each of the herbaria of the University of Michigan and the Chicago Natural History Museum. Some other sets are deposited in the U. S. National Herbarium, the Gray Herbarium at Harvard University, the "Instituto de Biología de la U. N. A. de México" and in the "Dirección general de Agricultura de México."

EQUISETACEAE

Equisetum giganteum L.—In swampy open thickets, Unión Juárez, No. 2780, in brook side wet thickets, at 1600 m., alt., Cascada, Siltepec, No. 5057. Local name: "Cola de Caballo."

LYCOPODIACEAE

Lycopodium clavatum L.—At an altitude 2600 m., sunny ridge, Pico de Loro, Sierra Madre, No. 4080.

Lycopodium complanatum L.—Among moist rocks, at 2600 m. alt., Pico de Loro, Sierra Madre, No. 4079.

Lycopodium Pringlei Underw. & Lloyd.—On tree, in wet forest, Mt. Pashtal, Sierra Madre, No. 225.

Lycopodium reflexum Lam.—On tree, in wet forest, 1200 m. alt., Unión Juárez, No. 2749.

Lycopodium Skutchii Maxon.—On tree, in wet forest, Vol. Tacaná, west slope, 2800 m. alt., No. 2931.

Lycopodium taxifolium Sw.—On tree, in wet forest, Siltepec, No. 1632.

Lycopodium Tuerckheimii Maxon.—On tree in wet forest, Siltepec, No. 1631.

SELAGINELLACEAE

Selaginella binervis Liebm.—On wet sunny ridge, on southern slope of Vol. Tacaná, No. 2478.

Selaginella cuspidata Link.—On wet sunny ridge, Mt. Ovando, Nos. 230, 4219; on wet edge of forest, Cascada, Siltepec, No. 1727; on wet rocky ridge, Salina, Siltepec, No. 1900.

Selaginella cuspidata var. *elegeta* Spring.—In wet forest edge, Mt. Pashtal, 200 m. alt., No. 227; at brook side, on wet rock, at 900 m. alt., Nuevo Amatenango, No. 4793.

Selaginella faucium Liebm.—On wet ridge, Vol. Tacaná, near Unión Juárez, No. 2782.

Selaginella Martensii Spring.—In wet field, Siltepec, Nos. 226, 228.

Selaginella pilifera A. Br.—On wet edge of forest, Siltepec, No. 229.

Selaginella Poeppigiana (H. & G.) Spring.—On wet edge of forest at 2800 m. alt., on east slope of Vol. Tacaná, No. 2911.

OPHIOGLOSSACEAE

Ophioglossum reticulatum L.—On wet shady brook side, at altitude of 1300 m. alt., Nuevo Amatenango, No. 4719; in wet field, Cascada, Siltepec, No. 1614.

SCHIZAEACEAE

Aneimia hirsuta (L.) Sw.—In thickets, Nuevo Amatenango, Nos. 2802, 4751, 4892; in riverside thickets, Cascada, Siltepec, No. 1767.

Aneimia phyllitidis (L.) Sw.—In wet woods, Monte Cristo, No. 2053; in brookside thickets, Nuevo Amatenango, No. 4803; on wet edge of woods, Barranca Honda, No. 4030.

Lygodium polymorphum (Cav.) H.B.K.—In shady thickets, Esperanza, Escuintla, No. 16462. Local name: "Crespillo."

GLEICHENIACEAE

Dicranopteris bifida (Willd.) Maxon.—In second growth, Boqueron, No. 15392.

HYMENOPHYLLACEAE

Hymenophyllum fucoides Sw.—On trunk in wet forest, Vol. Tacaná, west slope, No. 2909.

Hymenophyllum polyanthos Sw.—On tree trunk, in wet forest, Mt. Ovando, No. 886.

Hymenophyllum trapezoidale Liebm.—On trunk, in wet forest, west slope of Vol. Tacaná, at 2800 m. alt., No. 2910.

Trichomanes radicans Sw.—In advanced forest, Letrero, Siltepec, No. 4326; in forest, Honduras, Siltepec, No. 4438; in wet forest, Pico de Loro, Sierra Madre, No. 4898; on tree trunk, in wet forest, Mt. Ovando, No. 185; on tree trunk in wet woods, Boqueron, Motozintla, No. 5348.

Trichomanes radicans var. *Kuntzeanum* (Hook.) Hieron.—On tree trunk, in wet forest, west slope of 3000 m. alt., Vol. Tacaná, No. 2369.

POLYPODIACEAE

Acrostichum aureum L.—On sandy sunny beach. Las Garzas, Acapetahua, No. 2672.

Adiantum andicola Liebm.—Mostly in sunny pine woods, Pinada, Siltepec, No. 1909; in mixed woods, Mazapa, No. 4872; in mixed forest, Mt. Malé, No. 4640; in pine woods, Mt. Ovando, No. 887; Mt. Pashtal, No. 224; in open woods; Siltepec, No. 218.

Adiantum Capillus-Veneris L.—In woods, at 2000 m. alt., Vol. Tacaná, No. 2423.

Adiantum pulverulentum L.—In mixed forest, Mt. Pashtal, No. 184.

Adiantum trapeziforme L.—In wet thickets, in lowland, Escuintla, No. 190.

Aspidium aculeatum Sw.—In dry woods, at 1300 m. alt., Nuevo Amatenango, No. 4767.

Asplenium achilleaefolium (M. & G.) Liebm.—In cypress woods, at 1300 m. alt., Mt. Ovando, No. 2637, No. 4173.

Asplenium auritum Sw.—In pine woods, at 3000 m. alt., Mt. Malé, No. 4666.

Asplenium castaneum Schl. & Cham.—On dry sunny rock, at 4000 m. alt., Vol. Tacaná, Nos. 2353, 2884.

Asplenium harpeodes Kuntze.—In dry woods, at 2100 m. alt., north slope of Vol. Tacaná, No. 2945.

Asplenium monanthes L.—On pine ridge, at 3200 m. alt., Mt. Malé, No. 4704.

Asplenium resiliens Kuntze.—In wet forest, at 2700 m. alt., Mt. Pashtal, No. 213.

Asplenium riparium Liebm.—In woods, at 1900 m. alt., Siltepec, N. 221.

Asplenium uniseriale Raddi.—In mixed woods, Siltepec, N. 219; in pine woods, Mt. Ovando, No. 885.

Athyrium achilleaefolium (M. & G.) Fée.—In wet forest, at 900 m. alt., Mt. Ovando, No. 4173.

Blechnum fraxineum Willd.—In moist forest, Escuintla, No. 188.

Blechnum occidentale L.—In mixed woods, at 2300 m. alt., near Aguas Calientes, Vol. Tacaná, No. 2591; on wet ridge, at 2300 m. alt., Mt. Boqueron, No. 5359.

Cheilanthes angustifolia (Kaulf.) Hook.—In open pine woods, Mt. Pashtal, No. 175, in mixed woods, Barranca Honda, Siltepec, No. 4098.

Cheilanthes farinosa (Forsk.) Kaulf.—In wet woods, Siltepec, No. 1700.

Cheilanthes intramarginalis (Kaulf.) Hook.—In open woods, Vol. Tacaná, north slope, 2100 m., alt., No. 2991.

Cystopteris fragilis (L.) Bernk.—In pine woods, Mt. Malé, at 3200 m. alt., No. 4692.

Diplazium denticulosum Desv.—On edge of wet woods, Escuintla, No. 183.

Diplazium francone Liebm.—In oak forest, Siltepec, No. 236.

Diplazium neglectum (Karst.) C. Chr.—In mixed forest, Mt. Ovando, 1800 m. alt., No. 3935.

Diplazium plantagineum (Linn.) C. Chr.—On wet grassy ridge, Siltepec, No. 222; on brook side, Mt. Ovando, No. 889.

Dryopteris denticulata var. *formosa* Fée.—In mixed forest, at 1900 m. alt., Pico de Loro, Sierra Madre, No. 4269.

Dryopteris equestris (Kuntze) C. Chr.—In mixed forest, Vol. Tacaná on north slope, 2100 m. alt., Nos. 2948, 2970.

Dryopteris panamensis (Presl.) C. Chr.—On edge of mixed forest, Escuintla, No. 189; in wet forest, Unión Juárez, No. 2766.

Dryopteris patens (Sw.) Kuntze.—On brook side or edge of mixed forest, Escuintla, No. 199.

Dryopteris patula (Sw.) Underw.—In mixed forest, Vol. Tacaná, on north slope, 1000 m. alt., No. 2452.

Dryopteris pseudosacra C. Chr.—On wet edge of woods, Chicomuselo, No. 4429.

Dryopteris rudis (Kuntze) C. Chr.—In mixed woods, Vol. Tacaná, west slope 2800 m. alt., No. 2914.

Dryopteris subinoisa (Willd.) Urban.—In wet mixed forest, at 2800 m. alt., Vol. Tacaná, west slope, No. 2915.

Elaphoglossum gratum (Fée) Moore.—In forest, on tree trunk, at 2000 m. alt., Mt. Ovando, No. 2584.

Gymnopteris rufa (L.) Underw.—In mixed forest, Mt. Madre Vieja, 1000 m. alt., No. 2523.

Hemionitis pinnatifida Baker.—On wet edge of forest, along roadside, Escuintla, No. 2128.

Leptochilus cladorrhiza (Spreng) Maxon.—In wet mixed forest 2000 m. alt., Mt. Pashtal, Sierra Madre, No. 220.

Llavea cordifolia Lag.—In pine woods, at 3000 m., Mt. Malé, No. 4642.

Notholaena bonariensis (Willd.) C. Chr.—On rock, in edge of moist forest, Mt. Ovando, west slope, 1500 m. alt., No. 197.

Notholaena sinuata (Sw.) Kaulf. On rocky hill, at 2000 m. alt., La Grandeza, No. 5542.

Odontosoria guatemalensis Chr.—In wet sunny thickets, at 2000 m. alt., Vol. Tacaná, No. 2435. New to Mexican flora.

Odontosoria Schlechtendalii (Presl.) C. Chr.—In wet or dry pine woods, Mt. Ovando, No. 223, in mixed advanced forest, Mt. Pashtal, at 1500-2000 m. alt., No. 223-B.

Phanerophlebia macrospora (Baker) Und.—In wet thickets, at 1300 m. alt., Barranca Honda, Siltepec, No. 4068.

Phanerophlebia remotispora Fourn.—In pineland, at 3000 m. alt., Mt. Malé, No. 4688.

Pityrogramma calomelaena (L.) Link.—In open forest, near Rosario de Vega, Siltepec, No. 217; in riverside thickets, Jilguero, Escuintla, Nos. 17262, 17419.

Pityrogramma tartarea (Cav.) Maxon.—In dry woods, at 2200 m. alt., No. 5398.

Plecosorus speciosissimus (A. Br.) Moore.—In woods, near Aguas Calientes, Vol. Tacaná, at 2000 m. alt., No. 2318.

Polypodium angustifolium Sw.—In margin of wet forest, Finca Juárez, Escuintla, No. 1752; on tree trunk, in virgin forest, Mt. Ovando, No. 882; on tree, in wet Honduras, Siltepec, No. 4371; in woods, at 2000 m. alt., La Grandeza, No. 15543.

Polypodium angustum (H. & B.) Liebm.—On edge of forest, Mt. Madre Vieja, No. 192; in moist woods, on tree trunk, Mt. Ovando, No. 883; in open woods, Pinabeto, Motozintla, No. 5423; on wet ridge, Cascade, Siltepec, No. 5083.

Polypodium heteromorphum H. & G.—On trees, in moist forest at 2800 m. alt., Vol. Tacaná, No. 2890.

Polypodium Lindenianum Kuntze.—In mixed forest, Mt. Ovando, No. 237; in pine woods, Mt. Malé, No. 4666.

Polypodium loriceum L.—On tree, in wet forest, at 1500-2000 m. alt., Mt. Ovando, No. 891.

Polypodium Loweii C. Chr.—In wet forest on western slope, at 1000-1700m. alt., Mt. Ovando, No. 890.

Polypodium moniliforme Leg.—Among sunny volcanic rocks, Vol. Tacaná at 4,000 m. alt., Nos. 2330, 2871.

Polypodium plabium S. & V.—On tree trunks, in woods, along brook side, Barranca Honda, Siltepec, No. 4075; on tree trunk in open thickets, Mt. Madre Vieja, at 800 m. alt., No. 191.

Polypodium plesiosorum Kuntze.—On trees in forest, Vol. Tacaná, north slope, 2000 m. alt., No. 2393.

Polypodium plumula H. & B.—On rocks in wet forest, Pico de Loro, Sierra Madre, No. 4268; in wet ravine, at 1000 m. alt., Mt. Ovando, No. 209; in wet woods, at 2000 m. alt., La Grandeza, No. 15598.

Polypodium polypodioides (L.) Watt.—On rocks, in open thickets, Letrero, Siltepec, No. 4346.

Polypodium sanctaerosae (Maxon) C. Chr.—In open thickets at 2300 m. alt., Mt. Ovando, No. 888.

Polypodium semihirsutum Kl.—On volcanic rock, on sunny ridge, Vol. Tacaná, 400 m. alt., near peak, No. 2879.

Polypodium serpentinum Christ.—On trees, in open woods, along wet stream side, Escuintla, No. 207.

Polypodium triseriale Sw.—On tree, in open mixed woods, Escuintla, No. 897.

Polypodium xalapensis (Fée) Christ.—On rock, in advanced forest, Mt. Madre Vieja, No. 187.

Polystichum maricatum (L.) Fée.—In woods, Mt. Ovando, No. 2066; in forest, at 2100 m. alt., north slope, Vol. Tacaná, No. 2971.

Polystichum polyphyllum Presl.—In pine woods, at 3000 m. alt., Vol. Tacaná, No. 2352.

Polystichum Trejoi Christ.—In ravine, at 2800 m. alt., western slope, Vol. Tacaná, No. 2935.

Pteris apicalis Liebm.—In woods, at 2800 m. alt., west slope, Vol. Tacaná, No. 2936; in wet thickets, at 3000 m. alt., Mt. Malé, No. 4665.

Pteris coriacea Desv.—In wet forest, at 500-1500 m. alt., Mt. Ovando, No. 2065.

Pteris cretica L.—In wet ravine, Mt. Malé, 3200 m. alt., No. 4639.

Pteris muricella Fée.—In brookside thickets, Mt. Ovando, 1500 m. alt., No. 233.

Pteris orizabae N. & G.—In brookside woods, 1900 m. alt., Siltepec, No. 235.

Pteris paucinervata Fée.—On wet ridge, near Aguas Calientes, at 2100 m. alt., on north slope, Vol. Tacaná, No. 2949.

Pteris quadriaurita Fée.—In wet thickets, at margin of woods, Escuintla, No. 200; in wet forest, Pico de Loro, Sierra Madre, No. 4274.

Rhipidopteris peltata (Sw.) Schott.—In wet forest, on tree trunk, at 700-1900 m. alt., Mt. Ovando, No. 1859; in cloud forest, at 1700 m. alt., Cascada, Siltepec, No. 5122.

Scoliosolus ensiformis (Hook.) Moore.—On wet brook side, Mt. Ovando, No. 214; in wet forest, on tree trunk, at 500-2800 m. alt., Vol. Tacaná, No. 2907.

Struthiopteris ensiformis (Liebm.) Broadf.—In wet forest, at 1700 m. alt., Mt. Ovando, No. 4192; in wet forest, Vol. Tacaná, on wet slope, 2800 m. alt., No. 2913.

Tectaria Martinicensis (Spreng.) Copel.—In wet ravine, Mt. Madre Vieja, at 700 m. alt., No. 234.

Trismeria trifoliata (L.) Diels.—On wet ridge, near Unión Juárez, 1400 m. alt., south slope, Vol. Tacaná, No. 2762; in riverside wet thickets, Jilguero, Escuintla, No. 17285.

Vittaria filifolia Fée.—On tree trunks, in wet forest, 1500 m. alt., Mt. Ovando, Nos. 215, 884, 4158; on sunny rock, Vol. Tacaná, at 1900 m. alt., No. 2878.

Vittaria lineata (L.) J. E. Smith.—In mixed forest, at 1700 m. alt. Frailesca, Siltepec, No. 5239.

Woodsia mollis (Kaulf.) J. Sm.—On wet rock, in forest, Vol. Tacaná, at 1000 m. alt., No. 2447; on rock, in pine woods, Mt. Malé, at 3200 m. alt., No. 4605.

Woodwardia spinulosa Mart. & Gal.—In shaded forest, Boqueron, No. 5383.

CYCADACEAE

Ceratozamia Matudai Lundell, *Lloydia* 2: 75. 1939.—On north slope 1000 m. alt., in open woods, formed cysasland more than one km. square, Mt. Ovando (type locality), Nos. 2645, 2646; in mixed forest, at 1500 m. alt., Monte Cristo, No. 4032.

Zamia loddigesii Miguel.—In bushes, Cacaluta, Acacoyagua, Nos. 16871, 17332; in woods, at 1000 m. alt., Mt. Ovando, Nos. 2659, 2087.

Zamia muricata Willd.—In sunny thickets, Mt. Ovando, 1000 m. alt., down to Acacoyagua vicinity, Nos. 105, 16368. Somewhat doubtful species.

PODOCARPACEAE

Podocarpus Matudai, Lundell, *Phytologia* 1: 212. 1937.—In dry or moist fores; at 2000 m. alt., Mt. Ovando, Nos. 956, 1847; in mixed forest, at 1500-2000 m. alt., Mt. Pashtal (type locality), No. 698. Local name: "Tabla." The plant occurs freely in Sierra Madre de Chiapas, from jurisdiction of Mapastepec to Guatemalan boundary, on Pacific slope, at 1500-2200 m. alt., in mixed forest.

PINACEAE

Abies guatemalensis Rehder.—In pineland, Mt. Malé, 3000 m. alt., No. 4654.

Abies tacanensis Lundell, *Amer. Midl. Nat.* 23: 175. 1940.—In pineland at 3000 m. alt., Vol. Tacaná, (type locality), No. 2367. Local name: "Pinabeto."

Pinus ayacahuite K. Ehrenberg.—In pineland, Mt. Malé, at 3000 m. alt., No. 4057; in pine woods, at 2300 m. alt., Mt. Pashtal, No. 293. Local name: "Tabla."

Pinus Hartwegii Lindl.—In mixed woods, at 2800 m. alt., south slope, Vol. Tacaná, No. 2853.

Pinus michoacana Martínez.—In pine woods, at 2400 m. alt., Tuixcum, Motozintla, No. 5534.

Pinus Montezumae Lamb.—On pine ridge at 2200-2500 m. alt., Mt. Malé, Nos. 4641, 4658; in pine woods, at 2100 m. alt., La Grandeza, N. 5583.

Pinus Montezumae var. *rudis* Schaw.—In pine woods, at 3900 m. alt., Vol. Tacaná, No. 2874.

Pinus oocarpa Schiede.—In pineland, at 2500 m. alt., Mt. Malé, No. 4595; in pineland, 1900 m. alt., Nuevo Amatenango, No. 4792; in mixed forest, at 2500 m. alt., Saxchanal, No. 4321; in pineland, at 1350 m. alt., Monte Cristo, Nos. 5931, 5932; in mixed woods, at 1300 m. alt., Barranca Honda, Nos. 4116, 4123; in La Grandeza, No. 5557.

Pinus oocarpa var. *ochoteranai* Martínez.—In mixed woods, at 1600 m. alt., Cascada, Siltepec, No. 5072; in pineland, at 1900 m. alt., Frailesca, Siltepec, No. 5231; in pineland, San Luis, Siltepec, No. 5973; in pine woods, at 2016 m. alt., La Grandeza, No. 5549; in pine woods, at 2400 m. alt., Tuixcum, No. 5530; in mixed forest, at 2200 m. alt., Caleras, Motozintla, No. 5524.

Pinus pseudostrobus var. *oaxacana* Martínez.—In pure pineland, at 2016 m. alt., La Grandeza, Nos. 5562, 5561.

Pinus teocote Schl. & Cham.—In pine woods at 1500-2300 m. alt., Mt. Ovando, No. 870.

CUPRESSACEAE

Cupressus Benthamii Endl.—At 2000-3000 m. alt., Mt. Ovando, and all over the Sierra Madre, No. 291. Local name: "Cipres."

Cupressus lusitanica Mill.—In pine woods, at 3000 m. alt., Mt. Malé, No. 4633; in pine woods, at 2000 m. alt., Frailesca, Siltepec, No. 5229.

Juniperus comitana Martínez.—In forest, La Grandeza, No. 5558, in wet ravine, Vol. Tacaná, No. 4411.

Juniperus mexicana Spreng.—On volcanic stony ridge, at 4000 m. alt., Vol. Tacaná, No. 2341.

Juniperus Standleyi Steyererm.—On dry cloud ridge, at 4000 m. alt., Vol. Tacaná, No. 2359.

Dicotyledoneae

PIPERACEAE

Peperomia granulosa Trelease.—On tree, in woods, Esperanza, Escuintla, No. 16635.

Peperomia mexicana Miq.—On wet rock, in mixed forest, Mt. Malé, No. 4647.

Peperomia pellucida (L.) H.B.K.—In wet swampy lowland, Escuintla, No. 846, on wet rock, in advanced forest, Mt. Ovando, No. 16594; in wet forest, at 2000 m. alt., Mt. Pashtal, No. 1696.

Peperomia peltata C. DC.—At 1200 m. alt., in wet forest, Mt. Ovando, No. 4194.

Peperomia umbilicata R. & P.—On wet rock of 1000-1500 m. alt., in rainy season, Mt. Ovando, No. 1857.

Piper aduncum L.—In forest, Esperanza, Escuintla, No. 16670. Local name: "Cordoncillo."

Piper Amalago L.—In woods, Boqueron, Motozintla, No. 5342.

Piper auritum H.B.K.—In wet, swampy thickets, Unión Juárez, at 1400 m. alt., No. 2771. In lowland thickets, Nuevo Amatenango, 1300 m. alt., No. 4743; in brookside thickets, Esperanza, Escuintla, No. 16617. Local name: "Hierva Santa."

Piper diandrum C. DC.—In woods, Esperanza, Escuintla, Nos. 16665, 16664, 16675, 16787, 16713, 16700, 16701. Local name: "Cordoncillo."

Piper felipense Trelease.—In sandy woods, Esperanza, Escuintla, No. 16430. Local name: "Corrimiento."

Piper fraguatum Trelease.—In woods, Esperanza, Escuintla, Nos. 16666, 16669, 16707, 16718, 16719. Local name: "Cordoncillo Morado."

Piper Martensianum C. DC.—In woods, Esperanza, Escuintla, No. 16604; in shaded bushes, Mojarra, Tonalá, No. 17134; in shaded woods, Huixtla, No. 17614. Local name: "Cordoncillo Verde."

Piper multinervium Mart. & Gal.—On stream side, Escuintla, No. 1042; in wet lowland, Chicomuselo, Nos. 4435, 4474.

Piper patulum Bertoloni.—In woods, Col. Hidalgo, Escuintla, No. 16590; in woods, Esperanza, Escuintla, Nos. 16674, 16711. Local name: "Corrimiento."

Piper rotundifolia (L.) HBK.—On tree, in woods, Esperanza, Escuintla, Nos. 16694, 17379, 2630.

Piper subcitrifolium C. DC.—In woods, Col. Cacao, Escuintla, Nos. 16385, 16595, 16720. Local name: "Cordoncillo Blanco."

Piper tuberculatum Jacq.—In wet thickets, often cultivated for hedge, Esperanza, Escuintla, No. 16625; in shaded bushes, Arista, Tonalá, No. 17366.

Piper umbellatum L.—On shaded brookside, Pinabeto, Motozintla, No. 5435; in lowland thickets or brook side, Esperanza, Escuintla, No. 16513.

Piper vergelense Trel.—In shaded woods, at 150 m. alt., Esperanza, Escuintla, No.

17460; in shaded woods, at 700 m. alt., Finca Corcega, Pueblo Nuevo Comaltitlan, No. 17832. Local name: "Cordoncillo."

CHLORANTHACEAE

Hedyosmum artocarpus Solms.—In second growth, Mt. Ovando, No. 660; the plant ranges all over the Sierra Madre, in wet second growth at altitude of 1500-2000 m.

SALICACEAE

Salix chilensis Molina.—On river side, at 1000 m. alt., Mazapa, No. 4605; on river side, Escuintla, Nos. 869, 16626; on river bank, Chicomuselo, No. 4441; along banks of Cacaluta River, Escuintla, No. 16452. Local name: "Sauce."

GARRYACEAE

Garrya laurifolia Hartweg.—In forest, Piñuela, at 700 m. alt., 28 km. northeast of Escuintla, No. 5006.

MYRICACEAE

Myrica cerifera L.—In open woods, at 1600 m. alt., Cascada, Siltepec, No. 5059; in woods, at 2000 m. alt., Pinabeto, Motozintla, No. 15436.

Myrica mexicana Willd.—In sunny woods, Mt. Pashtal, No. 397; in open woods, Salina, near Monte Cristo, No. 1943; in mixed forest, Barranca Honda, Siltepec, No. 4096. Local name: "Pimienta."

BATIDACEAE

Batis maritima L.—In open field near beach, Las Garzas, Acapetahua, No. 2690.

BETULACEAE

Alnus arguta (Schlecht.) Spach.—In mixed forest, at 1500 m. alt., Vol. Tacaná, south slope, No. 2818; in mixed forest, Mt. Malé, 2600 m. alt., No. 4636; in dry forest, Boqueron, Motozintla, No. 5341.

Carpinus caroliniana Walt.—In mixed forest, Mt. Ovando, No. 1855; in second growth, Vol. Tacaná, south slope near Chiquihuite, 1900 m. alt., No. 2752; in mixed forest, Siltepec, about 1500 m. alt., No. 1612.

Carpinus tropicalis (D. Sm.) Lundell, Lloydia 2: 79. 1939.—In mixed forest, at 1600 m. alt., Santa Rosa, Escuintla (type locality), No. 4244; in woods, Caleras, Motozintla, No. 5517.

Ostrya virginiana var. *guatemalensis* (Winkl.) Macbride.—In woods, at 1300 m. alt., San Luis, Siltepec, No. 5318.

FAGACEAE

Quercus acatenangensis Trel.—In forest, at 1500 m. alt., Mt. Ovando, No. 296; in mixed broadleaf zone, at 1800 m. alt., Mt. Pashtal, No. 1074.

Quercus Benthani A. Dc.—In forest, at 1700 m. alt., Mt. Ovando, No. 3935; in forest, at 1500-2000 m. alt., Vol. Tacaná, No. 2586.

Quercus boqueronae Trel.—In mixed forest, at 1700 m. alt., Mt. Ovando, Nos. 1823, 1824.

Quercus brachystachys Benth.—In forest, at 3000 m. alt., Mt. Malé, No. 4652.

Quercus conspersa Benth.—In pine woods, Motozintla, No. 4860; in mixed woods, Honduras, No. 4377; in mixed forest, Pashtal, No. 471; in pine woods, Mt. Malé, No. 4653; in mixed woods, at 1000-2000 m. alt., Nuevo Amatenango, No. 4748. Local name: "Roble."

Quercus corrugata Hook.—In forest, south slope, Mt. Ovando, No. 17875.

Quercus duratifolia C. H. Muller, U. S. Dept. Agri. Misc. Publ. 477: 50. 1942.—In mixed forest, Mt. Ovando, (type locality), Nos. 289, 857, 1827, 2073; in mixed

forest, Buena Vista, Escuintla, No. 1873; in mixed forest, at 1800-2200 m. alt., Letrero, Siltepec, No. 4360.

Quercus ovandensis Matuda.—In woods, south slope, Mt. Ovando, No. 17835.

Quercus paxtalensis C. H. Muller, U. S. Dept. Agri. Misc. Publ. 477: 75. 1942.—In mixed forest, at 1500-2500 m. alt., east slope, Mt. Pashtal (type locality), No. 1724.

Quercus peduncularis Nee.—In mixed forest, Siltepec, No. 1607; in pine woods, Motozintla, No. 4879; in mixed forest, Sazchanal, Sierra Madre, No. 4303; in mixed woods, Letrero, Siltepec, No. 4362; in mixed forest, at 1500 m. alt., Mazapa de Madero, No. 4879.

Quercus polymorpha Schul. & Cham.—In mixed forest, Santa Rosa, Escuintla, 1500 m. alt., No. 4234.

Quercus sapotaefolia Liebm.—In mixed forest, at 1500 m. alt., Santa Rosa, Escuintla, No. 4232.

Quercus Skinneri Benth.—In woods, Sta. Rosa, Escuintla, No. 17845.

CASUARINACEAE

Casuarina Cunninghamiana Miq.—Cultivated by Pan-American Railway, on road side around Huixtla and Tapachula.

ULMACEAE

Celtis iguanaea (Jacq.) Sarg.—In bushes, Esperanza, Escuintla, No. 16709; in thickets, Paredon, Tonalá, No. 16904.

Celtis monoica Hemsl.—In forest, Huisicil near Acacoyagua, No. 16976.

Chaetoptelea mexicana Liebm.—In mixed forest, at 1600 m. alt., Cascada, Siltepec, No. 5173.

Trema micrantha (L.) Blume.—In second growth, Escuintla, Nos. 1790, 16582. Local name: "Capulin."

MORACEAE

Artocarpus altilis (Parkinson) Fosberg.—Cultivated, often escaped on Pacific Coast, No. 17539. Local name: "Palo de Pan."

Castilloa elastica Cerv.—From sea level to 500 m. alt., in mixed forest, Escuintla, No. 17462. Local name: "Arbol de Hule."

Cecropia obtusifolia Bertoloni.—Common in second growth, from sea level to 700 m. alt., No. 16411. Local name: "Guarumo."

Clarisia mexicana (Liebm.) Lanjonus.—In forest, Esperanza, Escuintla, No. 17439; in forest, at 2580 m. alt., Pinabeto, Motozintla, No. 15476.

Chlorophora tinctoria (L.) Gaud.—In wet woods, Chicomuselo, No. 4506; in wet lowland forest, Acapetahua, Nos. 2711, 16651. Local name: "Mora."

Coussapoa Purpusii Standl.—In forest, Mt. Ovando, No. 446; in forest Santa Rita, Mapastepec, No. 2020; in mixed forest, 700 m. alt., Unión Juárez, No. 2796.

Dorstenia contrajerva L.—In wet forest, Mt. Ovando, No. 4216; in woods, Acacoyagua, Nos. 651, 17778. Local name: "Contrayerva."

Dorstenia contrajerva var. *Houstoni* (L.) Bureau.—In wet forest, at 1300 m. alt., Mt. Ovando, No. 17750.

Dorstenia contrajerva L. var. *tenuiloba* (Blake) Standl. & Steyererm.—In shaded forest, Corcega, Pueblo, Nuevo Comaltitlan, No. 17650. New to Mexican flora.

Ficus carica L.—Cultivated, without number. Local name: "Higo."

Ficus chiapensis Lundell, Contr. Univ. Mich. Herb. 7: 6. 1942.—In Mazapa de Madero (type locality), No. 4862; on riverside wet bank, 1500 m. alt., Honduras, Siltepec, No. 4385.

Ficus Cockii Standl. ex. Char.—On river side, at 1300 m. alt., Mazapa de Madero, No. 4843.

Ficus costaricana (Liebm.) Miq.—In woods, Mt. Ovando, No. 104; in riverside woods, Malpaso, Siltepec, No. 4533; in sandy woods, Escuintla, N. 16441.

Ficus crassiuscula Warb.—In forest, Esperanza, Escuintla, at 200 m. alt., No. 17450. Local name: "Amate blanco de Monte."

Ficus glabrata H.B.K.—On river side, or in wet lowlands, on Pacific Coast, No. 17411; in brookside woods, Esperanza, Escuintla, No. 17093. Local name: "Amate."

Ficus Goldmanii Standl.—In woods, Mojarra, Tonalá, No. 17137.

Ficus Hemsleyana Standl.—In wet woods, Escuintla, Nos. 2029, 16824; in riverside woods, Chicomuselo, No. 15634; in woods, at 1000 m. alt., Mt. Ovando, No. 17049; in woods, Cacaluta, Acacoyagua, No. 16885. Local name: "Chile Amate."

Ficus involuta (Liebm.) Miq.—In woods, Acacoyagua, No. 16852; in woods, at 600 m. alt., Mt. Ovando, No. 17585.

Ficus lapathifolia (Liebm.) Miq.—In wet woods, La Grandeza, No. 5611.

Ficus ovalis (Liebm.) Miq.—In forest, Cacaluta, Escuintla, No. 16641. Local name: "Mata Palo."

Ficus padifolia HBK.—In brookside woods, Honduras, Siltepec, Nos. 4385, 4413.

Ficus radula Willd.—In wet thickets or stream side, Escuintla, Nos. 2168, 16774, 16378, 17540; in river side, Tuixcum, Motozintla, No. 5531. Local name: "Chile Amate."

Sahagunia mexicana Liebm.—In mixed woods, Escuintla, No. 4023.

Trophis chiapensis Brandeg.—In forest, at 1600 m. alt., Santa Rosa, Escuintla, No. 4241; in mixed forest, 1000 m. alt., Mt. Ovando, No. 3933; in wet forest, Haciendita, Escuintla, No. 5989.

Trophis chorizantha Standl.—In wet forest, at 800 m. alt., Mt. Ovando, No. 6157; in wet forest, at 1600 m. alt., Cascada, Siltepec, No. 5069.

Trophis cuspidata Lundell, Amer. Midl. Nat. 19: 427. 1938.—In wet forest, Mt. Ovando, (type locality), No. 1051; in mixed forest, at 2000 m. alt., Vol. Tacaná, No. 2370.

Trophis Matudai Lundell, Lloydia, 2: 81. 1939.—In mixed forest, at 1000 m. alt., Mt. Ovando (type locality), Nos. 1051, 2091, 3978, 4014.

Trophis racemosa (L.) Urban.—In forest, Mt. Ovando, No. 443; in mixed wet forest, Escuintla, No. 16794; in woods, Sta. Elena, Acapetahua, N. 16751.

URTICACEAE

Boehmeria caudata Sw.—In wet mixed forest, Mt. Pashtal, No. 113. Abundant all over the Sierra Madre.

Boehmeria ulmifolia Wedd.—In woods, at 2100 m. alt., Vol. Tacaná north slope, No. 2959.

Myriocarpa bifurcata Liebm.—In wet ravine, at 2500 m. alt., Pinabeto, Motozintla, No. 5476.

Myriocarpa longipes Liebm.—In wet edge of forest, Siltepec, No. 278; on wet ridge, 1900 m. alt., Mt. Ovando.

Phenax hirtus (Sw.) Wedd.—On brook side, Nuevo Amatenango, No. 4799; in wet ravine, at 1900 m. alt., Mt. Ovando, No. 3965.

Phenax hirtus var. *minor* Wedd.—In wet ravine at 1900 m. alt., Siltepec, No. 119.

Phenax mexicanus Wedd.—In wet thickets, Mt. Ovando, No. 112; in wet forest, Mt. Pashtal, No. 118, in wet ravine, Barranca Honda, Siltepec, No. 4035.

Phenax rugosus (Poir) Wedd.—On brook side, Finca Juárez, Escuintla, No. 1747; in wet ravine, about 1700 m. alt., Mt. Pashtal, No. 1016.

Pilea auriculata Liebm.—In woods, at 2800 m. alt., west slope, Vol. Tacaná, No. 2899.

Pilea dauciodora (R. & P.) Wedd.—In wet forest, Vol. Tacaná, west slope, Nos. 2334, 2903, in wet ravine, 2700 m. alt., Mt. Malé, No. 4607.

Pilea hyalina Fenzl.—In shaded margin of woods, Esperanza, Escuintla, No. 17178; on wet ridge, Barranca Honda, Siltepec, No. 4034.

Pilea microphylla (L.) Liebm.—Cultivated in garden, Escuintla, No. 16424. Local name: "Chiste."

Pilea pubescens Liebm.—In wet forest edge, Mt. Pashtal, No. 116; in wet edge of forest, at 1000 m. alt., Finca Juárez, Escuintla, No. 1745.

Pilea quercifolia Killip.—On wet brook side, Nuevo Amatenango, No. 4797; in wet forest, Letrero, Siltepec, No. 4341; in wet forest, Vol. Tacaná, No. 2360; in wet ravine, Mt. Ovando, Nos. 2573, 4198.

Pilea quichensis Donn. Sm.—On stream side, at about 700 m. alt., Salto de Agua, Escuintla, No. 103.

Pouzolzia Palmeri Wats.—In wet field, at 1200 m. alt., Mazapa, No. 4838.

Urera alceifolia Gaud.—In wet woods, at 2000 m. alt., Mt. Ovando, No. 4172; in wet ravine, Boqueron, No. 5347.

Urera baccifera (L.) Gaud.—In wet ravine, Esperanza, Escuintla, No. 17637. Local name: "Chichicaste."

Urera caracasana (Jasq.) Griseb.—In wet ravine, at 2000 m. alt., Mt. Pashtal, No. 1574; in thickets, Mt. Ovando, Nos. 115, 3956; in wet thickets, Barranca Honda, Siltepec, Nos. 4061, 5097; on wet shaded ridge, Boqueron, No. 15409; in wet ravine, Esperanza, Escuintla, Nos. 16681, 16825. Local name: "Chichicaste."

Urera elata (Sw.) Griseb.—In wet ravine, at 2400 m. alt., Pinabeto, Motozintla, No. 15440; in wet thickets, La Grandeza, No. 5579; in wet ravine, Rodeo, Siltepec, No. 4577; on wet ridge, Niquivil, No. 5487.

Urera Killipiana Standl. & Steyerl.—In shaded edge of brookside woods, at 2100 m. alt., La Grandeza, No. 5547. Known from Guatemala, new to Mexican flora.

PODOSTEMONACEAE

Marathrum Scheideanum Cham.—On stones or rocks in rivers, Jalapa, Cacaluta and Cintalapa, Escuintla, No. 600.

PROTEACEAE

Roupala borealis Hemsl.—In advanced forest, at 1200 m. alt., near Las Nubes, Mt. Ovando, No. 16241.

OLACACEAE

Heisteria acuminata B. & H.—In forest, Mt. Ovando, No. 959; in mixed forest, at 1300 m. alt., Unión Juárez, No. 2787.

Heisteria macrophylla Oerst.—In wet forest, La Grada, Escuintla, No. 16807; in wet forest, Corcega, Pueblo Nuevo Comaltitlán, at 700 m. alt., No. 17658; in forest, at 1500 m. alt., Mt. Ovando, No. 6122.

Ximenia americana L.—In woods, Mt. Ovando, No. 563; in wet woods, Escuintla, Nos. 2025, 2180, 2625.

LORANTHACEAE

Antidaphne viscidoides P. & E.—Parasite on tree, in forest, at 2000 m. alt., Mt. Ovando, No. 3927; in wet woods, Escuintla, No. 1049.

Oryctanthus cordifolium (Presl.) Urban.—Parasite on tree, in woods, Escuintla, Nos. 1803, 16555, 16386. Local name: "Liga."

Phoradendron annulatum Oliver.—In woods, Pinada, Siltepec, No. 6011; in forest, Boqueron, No. 5385.

Phoradendron multiflorum Trel.—In woods, Cerro Laguna, Mapastepec, No. 1040.

Phoradendron nervosum Oliver.—In woods, Escuintla, N. 826; in forest, at 2300 m. alt., Vol. Tacaná, No. 2920; in forest, La Calera, Motozintla, No. 5525; in open woods, Boqueron, Motozintla, No. 15339.

Phoradendron piperoides (H.B.K.) Trel.—In dry forest, Santa Rosa, Escuintla, No. 4261; in forest, at 1600 m. alt., Mt. Ovando, No. 4186; in woods, Jilguero, Escuintla, No. 16470; in woods, Esperanza, Escuintla, Nos. 16618, 16803.

Phoradendron quadrangulare (BBK.) Krug & Urban.—In d^r woods, Escuintla, No. 16575.

Phoradendron robustissimum Eichler.—In woods, Chicomuselo, No. 5632; in woods on river bank, Escuintla, No. 16431.

Phoradendron velutinum Nutt.—In woods, at 1350 m. alt., Montecristo, No. 5938; in woods, Siltepec, No. 5621.

Psittacanthus calyculatus (D.C.) Don.—In woods, on tree, Chicomuselo, No. 4439; in dry woods, on tree, near beach, Sta. Rosa, Tonalá, Nos. 17348, 17142; in woods, Acapetahua, No. 17253; in woods, Escuintla, No. 16657. Local name: "Visco," "Liga."

Psittacanthus Schiedeana (C. & S.) Blume.—In open dry thickets, Mazapa to Motozintla, No. 4847.

Struthanthus Aguilarii Standl.—In woods, Mt. Ovando, No. 4415.

Struthanthus brachybotrys Standl. & Steyerl.—In woods, Boqueron, Motozintla, No. 15362. Reported from Guatemala, new to Mexican flora.

Struthanthus capitatus Lundell, Contr. Univ. Mich. Herb. 7: 7. 42.—In open woods, Letrero, Siltepec (type locality), No. 4327.

Struthanthus cassythoides Millip.—On tree, in bushes, near beach, Cerrito, Acapetahua, No. 16769.

Struthanthus densiflorus (Benth) Standl.—In woods, Siltepec, No. 5615.

Struthanthus Deppeanus (C. & S.) Blume.—In wet forest, Mt. Ovando, No. 661; in open wet woods, at 2990 m. alt., Malé, No. 4678; in woods, at 2000 m. alt., La Grandeza, No. 5551.

Struthanthus macrostachyus Lundell, Lloydia, 4: 45. 1941.—In forest, Santa Rosa, Escuintla (type locality), No. 4258.

Struthanthus marginatus (Dess.) Blume.—In woods, Pinabeto, Motozintla, No. 15429; in woods, at 1400 m. alt., near Unión Juárez, south slope, Vol. Tacaná, No. 2794.

Struthanthus Matudai Lundell, Lloydia 4: 45. 1941.—In forest, at 1500 m. alt., Mt. Ovando (type locality), No. 1808.

Struthanthus orbicularis (H.B.K.) Blume.—In open woods, Escuintla, Nos. 2604, 4185, 6185; previously distributed as *Struthanthus escuintlensis* Lundell.

Struthanthus quercicola (C. & S.) Blume.—On tree, in open woods, Letrero, Siltepec, Nos. 4359, 4363.

Struthanthus tacanensis Lundell, Lloydia, 4: 46. 1941.—In forest, south slope of Vol. Tacaná (type locality), No. 2840; in forest, 1500-2000 m. alt., Unión Juárez, No. 2772.

Razoumofskyia vaginata (H.B.K.) Kuntze.—On pine trees, in pine woods, Honduras, Siltepec, No. 4408; on pine tree, at 2000-3000 m. alt., Mt. Malé, Nos. 4601, 4630.

ARISTOLOCHIACEAE

Aristolochia anguisida Jacq.—In open woods, Mojarra, Tonalá, No. 17132; in woods, La Grada, Escuintla, N. 17245. Local name: "Guaco."

Aristolochia grandiflora Sw.—In wet thickets, Escuintla, No. 494. Local name: "Sombrero de Don Zope."

Aristolochia maxima Jacq.—In wet thickets, Escuintla, Nos. 2138, 17628. Local name: "Guaco."

Aristolochia pilosa H.B.K.—In wet thickets, Escuintla, Nos. 2234, 16448, 18290. Local name: "Curarina."

Aristolochia Steyermarkii Standl.—In thickets, Finca Juárez, Escuintla, No. 1755. New to Mexican flora.

MITRASTEMONACEAE

Mitrostemon Matudai Yam. Tokyo Bot. Mag. 50: 539, 1936.—In oak woods, at 1500-1900 m. alt., Mt. Ovando (type locality), No. Ex.-1, parasite on horizontal root of *Quercus boqueronae*, February to April. New family and new genus to Mexican flora.

BALANOPHORACEAE

Helosis mexicana Liebm.—In wet forest, Mt. Ovando, No. 4167; in wet forest, in rainy season, at 1000 m. alt., Mt. Madre Vieja, No. 423.

POLYGONACEAE

Antigonon cenerascens M. & G.—In sandy stony field, near beach, Arista, Tonalá Nos. 17322, 17322.

Antigonon leptopus Hook. & Arn.—Cultivated freely, without number. Local name: "Confite."

Coccoloba caracasana Meisn.—In bushes, near beach, Las Garzas, Nos. 2677, 2806; in woods, Mapastepec, No. 17516; in woods, Tapachula, No. 17704. Local name: "Papaturo."

Coccoloba cozumelensis Hemsl.—In woods, Paredon, Tonalá, No. 16344.

Coccoloba escuintlensis Lundell, Phytologia 1: 213. 1937.—In wet woods, Esperanza, Escuintla (type locality), Nos. 413, 4143, 4145, 17466, 17410. Local name: "Carnero."

Coccoloba fluviatilis Lundell, Contr. Univ. Mich. Herb. 7: 8. 1942.—In river side woods, Malpaso, Siltepec (type locality), No. 4517.

Coccoloba floribunda (Benth.) Lindau.—In wet woods, Belem, Mapastepec, No. 16741; in woods, Mojarra, Tonalá, No. 17125; in woods, Las Garzas, Acapetahua, No. 2683.

Coccoloba Matudai Lundell, Contr. Univ. Mich. Herb. 7: 9. 1942.—In wet forest, at 2500 m. alt., Saxchanal, Sierra Madre, No. 4315; in wet forest, at 1500 m. alt., Finca Olvido, near Montecristo, Mapastepec; in forest, Cascada, Siltepec, No. 5144.

Coccoloba mayana Lundell.—In savanna woods, Chicomuselo, No. 5627; in woods, Nandolopez, Acapetahua, No. 16642. Local name: "Papaturo."

Coccoloba Schideana Lindau.—In wet woods, Escuintla, No. 2023; in woods, Mojarra, Tonalá, No. 17139. Local name: "Papaturo."

Muehlenbeckia platyclada Meisn.—Cultivated in garden, Siltepec, No. 615; in garden, Acacoyagua, No. 17528. Local name: "Siempre Verde," "Solitaria."

Muehlenbeckia tamnifolia (H.B.K.).—In thickets, at 1600-3000 m. alt., Vol. Tacaná, No. 2382; in sunny thickets, Cascada, Siltepec, No. 1060; in woods, at 2000 m. alt., Frailesca, Siltepec, No. 5222; in bushes, at 2580 m. alt., Pinabeto, Motozintla, No. 15438.

Muehlenbeckia volcanica (Benth.) Endl.—On sunny volcanic rock, at 3000 m. alt., Mt. Tacaná, No. 2382.

Polygonum hispidum H.B.K.—In swampy thickets, Las Garzas, Acapetahua, No. 2813.

Polygonum hydropiperoides Michx.—In riverside thickets, Mazapa, No. 4826.

Polygonum mexicanum Small.—In wet grassy thickets, Nandolopez, Acapetahua, No. 16648; in moist thickets, Escuintla, No. 2171.

Polygonum punctatum Ell.—In riverside thickets, Escuintla, No. 2174; on brook side, Honduras, Siltepec, Nos. 4900, 4527; in marsh, Chicomuselo, Nos. 4466, 4467; in wet

riverside thickets, Jilguero, Escuintla, No. 17268; on brook side, Mazapa, No. 4826.

Polygonum segetum H.B.K.—In riverside thickets, Mazapa, No. 8499; in riverside thickets, Chicomuselo, No. 4467.

Ruprechtia chiapensis Lundell, Phytologia. 1: 213. 1937.—On sunny, sandy beach, Las Garzas, Acapetahua (type locality), Nos. 2673 (fr.). 2695; in woods, Paredon, Tonalá, Nos. 16280, 16344. Previously distributed as "*R. Cumingii* Meisn."

Triplaris americana L.—In open thickets, Esperanza, Escuintla, Nos. 277, 814. Local name: "Mulato."

Triplaris melaenodendron (Bertol.) Standl. & Steyerem.—In woods, Esperanza, Escuintla, No. 17377.

CHENOPODIACEAE

Beta vulgaris L.—Cultivated only, without number. Local name: "Betabel."

Chenopodium ambrosioides L.—Cultivated, often escaped, Rodeo, Siltepec, No. 4565; in Acacoyagua, No. 16609. Local name: "Epazote."

Chenopodium murale L.—In sunny waste soil, Santa Rosa, Escuintla, No. 4250.

AMARANTHACEAE

Alternanthera ficoidea (L.) R. Br.—On grassy beach, Las Garzas, near Acapetahua, No. 2739.

Alternanthera gracilis (Moq.) Loes.—In forest, Mt. Ovando, Nos. 782, 16205; in forest, at 1000-1500 m. alt., Siltepec, No. 797; in shaded woods, Jilguero, Escuintla, No. 17281.

Alternanthera polygonoides (L.) R. Br.—In wet field, Col. Soconusco, Acapetahua, No. 16583.

Amaranthus acariosus Benth.—In grassy field, Mojarra, Tonalá, No. 17165.

Amaranthus hybridus L.—In waste soil, Escuintla, No. 1043; in thickets, at 1000 m. alt., Mt. Ovando. Local name: "Bledo."

Amaranthus spinosus L.—In thickets, at 1000 m. alt., Mt. Ovando, Nos. 6188, 6187.

Chamissoa altissima (Jacq.) H.B.K.—In open thickets, Triunfo, Escuintla, No. 390; in woods, Mt. Ovando, No. 16219.

Chamissoa Maximiliani Mart.—In thickets, Mojarra, Tonalá, No. 17163.

Cyathula achyranthoides (HBK.) Moq.—In shaded margin of woods, Esperanza, Escuintla, No. 17177; in thickets, Huixtla, No. 17613.

Cyathula prostrata (L.) Blume.—In shaded field, Jilguero, Escuintla, No. B.

Iresine arbuscula Uline & Bray.—In forest, at 1200 m. alt., Mt. Ovando, No. 16244; in woods, Cintalapa, Escuintla, No. 17426.

Iresine calea Ibañez) Standl.—In open woods, at 1600 m. alt., Cascada, Siltepec, No. 5060.

Iresine Celosia L.—In sunny thickets, Escuintla, Nos. 893, 17572; in edge of forest, Mt. Madre Vieja, No. 650; in grassy field, Mojarra, Tonalá, No. 17174; in field, at 1600 m. alt., Cascada, Siltepec, No. 5067.

Iresine frutescens Moq.—In sunny thickets, Acacoyagua, Escuintla, No. 893.

Iresine Herreræ Blake.—In forest, Mt. Ovando, No. 969; in edge of forest, about 1500 m. alt., Mt. Pashtal, No. 2249.

Iresine nigra Uline & Bray.—In forest, Mt. Ovando, Nos. 971, 16206; in wet forest, Santa Rita, Mapastepec, No. 1997.

Philoxerus vermicularis (L.) R. Br.—In sandy field, Paredon, Tonalá, No. 16350.

NYCTAGINACEAE

Boerhaavia caribaea Jacq.—In grassy thickets, Siltepec, No. 1610.

Boerhaavia coccinea.—On sandy road side, Escuintla, No. 954.

Boerhaavia erecta L.—In sandy thickets, Mazapa, No. 4807; in sandy, sunny thickets, Motozintla, No. 4423; in sandy, sunny field, Mojarra, Nos. 17233, 16893. Local name: "Golondrina."

Bougainvillea glabra Choisy.—Cultivated generally in gardens, along Pan-American Railway, up to 1500 m. alt., No. 17483. Local name: "Bugambilia."

Bougainvillea Butiana Holtum & Standl.—Cultivated, Esperanza, Escuintla, No. 17536. Local name: "Bugambilia."

Mirabilis jalapa L.—Cultivated, Escuintla, No. 621. Local name: "Maravilla."

Neea psychotrioides Donn. Smith.—In sandy woods, Acacoyagua, No. 5337; in sandy bushy area, Cintlapa, Escuintla, No. 16576; in woods, Paredon, Tonalá, No. 16351. Local name: "Posolito."

Neea turbinata Lundell, Contr. Univ. Mich. Herb. 7: 10. 1942.—In sunny woods, Escuintla (type locality), Nos. 647, 913, 948, 2615. Distributed as "*N. psychotrioides* Donn. Sm."

Pisonia aculeata L.—In woods, near beach, Paredon, Tonalá, No. 16317.

Salpianthus arenarius Humb. & Bonpl.—In sandy field, Paredon, Tonalá, near beach, Nos. 16323, 16304, 17161, 16934. Local name "Pie de Paloma."

PHYTOLACCACEAE

Petiveria alliacea L.—In sandy thickets, Escuintla, No. 139; in thickets, at 700 m. alt., Mt. Ovando, No. 17094; in field, Paredon, Tonalá, No. 16903. Local name: "Zorrillo."

Phytolacca icosandra L.—In edge of forest, Mt. Ovando, Nos. 873, 17740; in wet edge of forest, 2300 m. alt., Saxchanal, Sierra Madre, Nos. 17679, 4325; sandy bank of Cintalapa River, Jilguero, Escuintla, No. 16505; San Luis, Siltepec, No. 5288.

Phytolacca rivinoides Kunth & Bouché.—In sandy soil, at upper course of Cacaluta River, Escuintla, No. 16806.

Rivina humilis L.—In shady second growth, Mt. Ovando, No. 643; in forest or second growth, Monte Cristo, No. 1972; in grassy field, Haciendita, Siltepec, No. 5986; in field or in woods, Esperanza, Escuintla, No. 16522; in shaded field, Mojarra, Tonalá, No. 17184.

Stegnosperma membranaceum Lundell, in Sched.—In thickets, near beach, Las Garzas near Acapetahua (type locality), No. 2808.

Stegnosperma scandens (Lunan) Standl.—In woods, near beach, Belem, Mapastepec, No. 16738.

Trichostigma octandrum (L.) H. Walt.—In woods, Esperanza, Escuintla, No. 17541.

ACHATOCARPACEAE

Achatocarpus nigricans Triane.—In woods, near beach, Paredon, Tonalá, Nos. 16356, 16335, 16355. Local name: "Limoncillo."

AIZOACEAE

Glinus radiatum (R. & P.) Rohrb.—In sandy, sunny field, near beach, Paredon, Tonalá, No. 16296.

Mollugo verticillata L.—On sunny ground, Esperanza, Escuintla, No. 17465.

Sesuvium sessile Pers.—In grassy, wet thickets near beach, Las Garzas near Acapetahua, No. 2700.

PORTULACACEAE

Portulaca pilosa L.—On sunny, grassy soil, Esperanza, Escuintla, No. 17694. Local name: "Mañanita."

Talinum paniculatum (Jacq) Gaerth.—On river side, San Luis, Siltepec, No. 18194, in sandy thickets, 1800 m. alt., Mt. Ovando, No. 561; in sandy thickets, Acacoyagua, Nos. 17623, 17825. Local name: "Berdolaga."

Talinum triangulare (Jacq.) Willd.—In sandy soil, Chicomuselo, No. 18191.

BASELLACEAE

Boussingaultia leptostachya Macq.—In dry thickets near beach, Sta. Rosa, Tonalá, No. 17350.

Boussingaultia ramosa (Maq.) Hemsl.—In forest, Finca Suiza, Monte Cristo, No. 1945. Previously distributed as "*B. baselloides*."

CARYOPHYLLACEAE

Arenaria lanuginosa (Michx.) Rohrb.—On volcanic rock, at 4000 m. alt., Vol. Tacaná, No. 2882; in San Luis, Siltepec, No. 18293; in wet forest edge, Mt. Ovando, Nos. 475, 16260, 17725.

Drymaria cordata (L.) Willd.—In wet edge of forest, at 1900 m. alt., Mt. Ovando, No. 2287.

Drymaria hypericifolia Briq.—On wet grassy edge of forest, at 2000 m. alt., Mt. Ovando, No. 4000; in wet thickets, Finca Suiza, Monte Cristo, No. 2008; in wet thickets, Escuintla, No. 2283; in shade of volcanic rock, at 4000 m. alt., Vol. Tacaná, No. 2994.

Drymaria villosa C. & S.—In wet field, Nuevo Amatenango, No. 4752.

Stellaria irazuensis Donn. Smith.—In wet pine woods, at 300 m. alt., Mt. Malé, No. 4643; in wet woods, at 2700 m. alt., Mt. Pashtal, No. 2189; in moist forest, at 1900 m. alt., Pico de Loro, Sierra Madre, No. 4279.

Stellaria limitana Standl.—In riverside, sandy thickets, at 1400 m. alt., Vol. Tacaná near Unión Juárez (type locality), No. 2775.

Stellaria nemorum L.—In edge of wet forest, at 1000-2000 m. alt., Vol. Tacaná, No. 2504; in edge of forest, Mt. Pashtal, No. 2188.

Stellaria ovata Willd.—In wet thickets, Mt. Pashtal, No. 1698; in thickets, Mt. Ovando, No. 2199; on wet ridge, Vol. Tacaná, No. 2881; in cloud forest, Tres Cruces, Sierra Madre, No. 5026.

Stellaria prostrata Ell.—In pine woods, at 3000 m. alt., Mt. Malé, No. 4662.

NYMPHAEACEAE

Cabomba aquatica Aubl.—In stream, Las Garzas near Acapetahua, No. 2703.

Cabomba piahyensis Gardn.—In swamp, Paredon, Tonalá, No. 16291.

Nymphaea ampla (Salisb.) DC.—In Swamp, near beach, Paredon, Tonalá, No. 16271. Local name: "Flor de Laguna."

Nymphaea blanda G. Meyer.—Cerrito, Acapetahua, No. 16760; in swamp, Esperanza, Escuintla, No. 16972. Local name: "Valona."

RANUNCULACEAE

Clematis dioica L.—In open thickets, Siltepec, No. 1717.

Clematis grossa Benth.—In open thickets, Mt. Ovando, Nos. 6197, 3989; in thickets, at 2000 m. alt., north slope, No. 2426; in thickets, Escuintla, No. 988. Local name: "Cruz Mecate."

Ranunculus pilosus H.B.K.—On open wet grassy ground, Siltepec, No. 1063; in wet woods, at 1900 m. alt., Mt. Ovando, No. 18196.

Thalictrum Galeottii Lec.—In open thickets, at 1500 m. alt., Mt. Pashtal, Sierra Madre, No. 2250.

Thalictrum guatemalense C. DC. & Rose.—In open thickets, Cascada, Siltepec, No. 1739.

BERBERIDACEAE

Berberis chiapensis (Lundell) Lundell, Lloydia 3: 209. 1940; Field & Labor. 8: 3. 1945.—In edge of forest, at 2100 m. alt., Mt. Ovando (type locality), No. 3996. Known only from type locality.

MENISPERMACEAE

Cissampelos grandifolia Trm. & Planch.—In open second growth, Escuintla, Nos. 1600, 16542. Local name: "Curarina."

Cissampelos Pareira L.—In thickets, Siltepec, No. 1573; in edge of forest, Esperanza, Escuintla, Nos. 2246, 6076; in second growth, Honduras, Siltepec, Nos. 4420, 15616; in thickets, Letrero, Siltepec, No. 4357; in open bushes, Mazapa, No. 4817; in thickets, Mojarra, Tonalá, No. 17150.

Hyperbaena mexicana Miers.—In sandy open woods, Sta. Rosa, Tonalá, Nos. 17344, 17120; in woods, near beach, Cerrito, Acapetahua, No. 17719.

Hyperbaena vulcanica Standl. & Steyerl.—Woody ravine; in forest, at 150 m. alt., Esperanza, Escuintla, Nos. 16516, 16819. Local name: "Bejuco prieto." Reported from Guatemala, new to Mexican flora.

Odontocarya nitida Riley.—In bushes, near beach, Mojarra, Tonalá, No. 17141.

MAGNOLIACEAE

Drimys granadensis L. f. var. *mexicana* A. C. Smith.—In wet woods, at 2760 m. alt., Niquivil, near Guatemalan border, No. 5494; in cloud forest, at 2600 m. alt., Tres Cruces, Sierra Madre, No. 5021; in cloud forest, at 2200 m. alt., Saxchanal, No. 17798.

Drimys Winteri Forst.—In forest, at 2700 m. alt., Saxchanal, Sierra Madre, No. 4387; in forest, Barranca Honda, Siltepec, No. 4055; in open forest, Mt. Pashtal, No. 456.

ANNONACEAE

Annona diversifolia Safford.—Cultivated, Escuintla, without number. Local name: "Fapahuca."

Annona lutescens Safford.—Cultivated, often escaped, Acacoyagua, Escuintla, without number. Local name: "Anona Amarilla."

Annona reticulata L.—Cultivated, Acacoyagua, Escuintla, without number. Local name: "Anona."

Annona muricata L.—Cultivated, Acacoyagua, Escuintla, No. 16821. Local name: "Guanaba."

Annona purpurea Mocino & Sessé.—In stony, sandy thickets, Acacoyagua, Nos. 16849, 17545. Local name: "Chincuya."

Annona scleroderma Stafford.—In wet woods, at 200 m. alt., Esperanza, Escuintla, No. 18405. Local name: "Chirimoya," "Annona de Monte." New to Mexican flora.

Annona spraguei Stafford.—On sandy river side, Col. Hidalgo, Acacoyagua, No. 16888. Local name: "Chincuya de llano." New to Mexican flora.

Cymbopetalum penduliflorum (D.) Baill.—In wet forest, Esperanza, Escuintla, No. 3237. Local name: "Orejuela."

Cymbopetalum stenophyllum Donn. Smith.—In wet woods, Esperanza, Escuintla, No. 16393; in woods, Cacaluta, Acacoyagua, No. 16876. Local name: "Orejuela."

Desmopsis lanceolata Lundell, Lloydia 2: 85. 1939.—In virgin forest, at 2200 m. alt., Mt. Ovando (type locality), No. 2299.

Rollinia jimenenau Standl.—In sandy woods, Esperanza, Escuintla, No. 16581.

Rollinia mucosa (Jacq) Baill.—In mixed sandy open forest, Escuintla, No. 1084. Local name: "Anonita."

Sapranthus chiapensis Standl. in Sched.—In woods, Nueva Libertad, Escuintla, No.

16466. Local: "Haste." In woods, Col. Jamaica, Escuintla, No. 16420. (Type locality). Local name: "Patate de Mico."

Sapranthus microcarpus (Donn. Smith) Fries.—In mixed forest, at 1200 m. alt., Mt. Ovando, No. 6145; in woods, Piñuela, Escuintla, No. 17836; in forest, Esperanza, Escuintla, 300 m. alt., Nos. 17296, 17496.

Xylopia frutescens Aubl.—In forest, Nueva Libertad, Escuintla, No. 16471.

MONIMIACEAE

Mollinedia guatemalensis Perk.—In mixed forest, at 1500 m. alt., Mt. Ovando, Nos. 2094, 17736, 17731, 2094, 1826; in wet forest, Cascada, Siltepec, No. 5117; in forest, at 2300 m. alt., Mt. Boqueron, No. 5414.

Mollinedia viridiflora Tull.—In wet forest, at 1200 m. alt., Mt. Ovando, No. 442.

Siparuna nicaraguensis Hemsl.—In wet edge of forest, at 1800 m. alt., Vol. Tacaná, Nos. 2448, 2481; in wet thickets, Mt. Madre Vieja, No. 2528; in wet woods, at 700-1500 m. alt., Unión Juárez, N. 2768; in woods, Montecristo, No. 5933; in woods, Pinabeto, No. 5474; in woods, La Grada, Escuintla, No. 16828. Local name: "Limoncillo."

LAURACEAE

Endlicheria zapotoides Lundell, Wrightia 1: 146. 1946.—In woods, Cascada, Siltepec, N. 5153. New to Mexican flora.

Litsea acuminatissima Lundell, Contr. Univ. Mich. Herb. 4: 3. 1940.—In advanced forest, at 2300 m. alt., Saxchanal, Sierra Madre (type locality), No. 4284.

Litsea glaucescens HBK.—In forest, at 1600 m. alt., Cascada, Siltepec, No. 5065.

Litsea Matudai Lundell, Contr. Univ. Mich. Herb. 4: 4. 1940.—In mixed forest, west slope, Vol. Tacaná (type locality), No. 2933.

Misanteca glaberrima (Lund.) Lundell, Wrightia 1: 148. 1946.—In open woods, north slope, 2100 m. alt., Vol. Tacaná (type locality), No. 2981.

Misanteca lucida (Lund.) Lundell, Wrightia 1: 147. 1946.—In forest, at 1600 m. alt., Santa Rosa, Escuintla (type locality), No. 4239.

Nectandra glandulosa Lundell, Wrightia 1: 148. 1946.—In mixed forest, Monte Cristo (type locality), No. 5434.

Nectandra Matudai Lundell, Wrightia 1: 149. 1946.—In mixed forest, Malpaso, Siltepec (type locality), No. 4522.

Nectandra reticulata (R. & P.) Mez.—In open woods, Escuintla, Nos. 383, 17247. Local name: "Tepeaguacate."

Nectandra salicifolia (HBK.) Nees.—In wet forest, at 1900 m. alt., Haciendita, Escuintla, No. 5983; in advanced forest, Mt. Ovando, No. 16208; in forest, Sta. Isabel, Motozintla, No. 16391.

Nectandra sinuata Mez.—In open woods, Esperanza, Escuintla, No. 5400; in forest, Mt. Ovando, No. 6143.

Ocotea chiapensis (Lundell) Standl. & Steyerl. Fred. Muse. Nat. Hist. 23: 14. 1944.—In mixed forest, Cerro de Mapastepec (type locality), No. 2052; in wet forest, Rodeo, Siltepec, No. 4579.

Ocotea Dendrodaphne Mez.—In forest, at about 1300 m. alt., Mt. Ovando, No. 6142.

Ocotea escuintlensis Lundell, Contr. Univ. Mich. Herb. 6: 15. 1941.—In open woods, Acacoyagua, Escuintla (type locality), No. 654. Local name: "Pimientillo." To be reduced to syn., *O. veraguensis*.

Ocotea Matudai Lundell, Bull. Torrey Club 69: 388. 1942.—In wet forest, Mt. Ovando (type locality), Nos. 4221, 4188.

Ocotea ovandensis Lundell, Contr. Univ. Mich. 6: 16. 1941.—In mixed advanced

forest, Mt. Ovando (type locality), Nos. 444, 1839; in wet forest, Mt. Pashtal, No. 1012; in dense forest, Letrero, Siltepec, No. 4369.

Ocotea subalata Lundell, Lloydia 4: 48. 1941.—In mixed forest, north slope, at 2100 m. alt., Vol. Tacaná (type locality), No. 2947; in forest, Boqueron, Motozintla, No. 5376.

Ocotea veraguensis (Meissn.) Mez.—In sandy woods, Acacoyagua, Nos. 16413, 16695, 16781, 16793; in wet woods, San Luis, Siltepec, No. 5301; in woods, at 1700 m. alt., Cascada, Siltepec, Nos. 5141, 5157, 5103; in woods, Huixtla, No. 17610. Local name: "Pimientillo."

Persea americana Mill.—Cultivated. Local name: "Aguacate."

Persea Chamissonis Mez.—In dark forest, Pinada, Siltepec, No. 1942; in dry advanced forest, Letrero, Siltepec, No. 4355.

Persea chiapensis Lundell, Wrightia 1: 150. 1946.—In dense forest, Niquivil, Motozintla, Nos. 5498, 5626; in virgin forest, at 1900 m. alt., Calera, No. 5526 (type locality).

Persea chrysobalanoides Lundell, Wrightia 1: 151. 1946.—In wet forest, at 2000 m. alt., La Grandeza (type locality), No. 5582.

Persea Donnell-Smithii Mez.—In forest, at 1700 m. alt., Cascada, Siltepec, No. 5091.

Persea floccosa Mez.—In open forest, Rodeo, Siltepec, No. 559; in wet forest, Ventana, Siltepec, No. 4545.

Persea flavifolia Lundell, Contr. Univ. Mich. Herb. 6: 17. 1941.—In advanced dry forest, at 2000 m. alt., Mt. Ovando (type locality), Nos. 1821, 2651.

Persea Matudai Lundell, Lloydia 4: 49. 1941.—On advanced forest, Las Cadenas, near Escuintla (type locality), No. 1380.

Persea Standleyi Allen.—In advanced forest, Boqueron, Nos. 15394, 15361. Reported from Guatemala; new to Mexican flora.

Phoebe acuminatissima Lundell, Contr. Univ. Mich. Herb. 6: 19. 1941.—In mixed wet forest, Mt. Ovando (type locality), Nos. 569, 2107, 6156.

Phoebe areolata Lundell, Contr. Univ. Mich. Herb. 7: 13. 1942.—In mixed forest, Saxchanal, Sierra Madre, at 2300 m. alt. (type locality), No. 4296.

Phoebe Bourgeauviana Mez.—In mixed forest, Pinabeto, Motozintla, Nos. 15453, 17437; in mixed forest, at 2300 m. alt., Boqueron, Motozintla, Nos. 15352, 15378, 15375.

Phoebe chiapensis Lundell, Contr. Univ. Mich. Herb. 6: 21. 1941.—In mixed forest, at 1000 m. alt., Mt. Ovando (type locality), Nos. 429, 2064.

Phoebe helicterifolia (Meisn.) Mez.—In mixed forest, at 1700 m. alt., Mt. Ovando, Nos. 16224, 6095.

Phoebe mexicana Meisn.—In open woods, Escuintla, Nos. 2632, 17463, 17641. Local name: "Tepeaguate liso."

Phoebe obtusata Lundell, Contr. Univ. Mich. Herb. 6: 21. 1941.—In forest, at 1300 m. alt., Mt. Ovando, No. 3986; in woods, Buena Vista, Escuintla (type locality), No. 1887.

Phoebe Pittieri Mez.—Escuintla, No. 2252; in mixed forest, at 2700 m. alt., Saxchanal, Sierra Madre, No. 4307. New to Mexican flora.

Phoebe platyphylla Lundell, Contr. Univ. Mich. Herb. 6: 23. 1941.—In open woods, Finca Suiza, Monte Cristo (type locality), No. 1930.

Phoebe Salvini (Mez) Lundell, Contr. Univ. Mich. Herb. 6: 23. 1941.—In forest, Mt. Pashtal, No. 2209; in advanced forest, at 2600 m. alt., Rodeo, Siltepec, No. 4578.

Phoebe saxchanalensis Lundell, Contr. Univ. Mich. Herb. 7: 14. 1942.—In virgin forest, at 2400 m. alt., Saxchanal, Sierra Madre (type locality), No. 4311.

Phoebe siltepecana Lundell, Wrightia 1: 151. 46.—In woods, about 1300 m. alt., Cascada, Siltepec (type locality), Nos. 5140, 5175.

PAPAVERACEAE

Argemone mexicana L.—In sandy, open grassy pine woods, Motozintla, No. 4880. Local name: "San Carlos."

Bocconia arborea Wats.—Mostly in sunny second growth, at 1000 m. alt., Vol. Tacaná, No. 2917; Mt. Ovando, No. 6683; Mazapa, No. 4882; Barranca Honda, Siltepec, No. 4041; in open woods, Boqueron, No. 15417.

Bocconia oblanceolata Lundell, Contr. Univ. Mich. Herb. 4: 5. 1940.—In secondary thickets, west slope, 2800 m. alt., Vol. Tacaná (type locality), No. 2916; in second growth, Mt. Ovando, No. 2194.

Papaver somniferum L.—Cultivated in Rodeo. Local name: "Amapola."

CAPPARIDACEAE

Capparis Baducca L.—In woods, Haciendita, at 1800 m. alt., in Sierra Madre, 60 km. northeast of Escuintla, No. 18215.

Capparis cynophallophora L.—In woods, near beach, Cerrito, Acapetahua, Nos. 16768, 17715; in woods, near beach, Paredon, Tonalá, No. 16957.

Capparis flexuosa L.—In open thickets near beach, Las Garzas, Acapetahua, No. 2805; in riverside woods, Chicomuselo, No. 5633; on sandy beach, Paredon, Tonalá, Nos. 16286, 16936; in woods, Belem, Mapastepec, N. 16737. Local name: "Clavelina."

Capparis hexandra Blake.—In wet forest, south slope, at 1000 m. alt., Mt. Ovando, No. 6025.

Capparis indica (L.) Fawc. & Rendle.—In sandy woods, Paredon, Tonalá, No. 16328.

Capparis Pringlei Briq.—In open stony thickets, Mazapa de Madero, No. 4853.

Cleome sp.—In wet woods, at 1100 m. alt., Mt. Ovando, No. 6062.

Cleome mexicana Hemsl.—In grassy thickets, near beach, Las Garzas, Acapetahua, No. 2809.

Crataeva Palmeri Rose.—In grassy thickets, at 1050 m. alt., near Las Nubes, Mt. Ovando, No. 16207.

Crataeva Tapia L.—In sandy woods, Sta. Rosa, Tonalá, Nos. 17338, 17153, 17222, 16926.

Forschammeria Matudai Lundell.—In mixed forest, at 1100 m. alt., near Finca Mag-nolia, Mt. Ovando (type locality), No. 2650.

Gynandropsis speciosa (HBK.) DC.—Mostly cultivated, often escaped, Esperanza, Escuintla, No. 16672. Local name: "Cachofla."

Polanisia viscosa (L.) DC.—In wet field, Belem, Mapastepec, No. 16745; in thickets, Acacoyagua, No. 17500.

Steriphoma clara Standl.—In thickets, Cacaluta, Escuintla, No. 16531; in thickets, Belem, Mapastepec, No. 17595. Local name: "Barba de Leon."

MORINGACEAE

Moringa oleifera Lam.—In sandy woods, near beach, Sta. Rosa, Tonalá, Nos. 17334, 17320; Acacoyagua, No. 16726. Local name: "San Jacinto."

BRASSICACEAE

Brassica oleracea var. *botrytis* L.—Cultivated, without number. Local name: "Coliflor."

Brassica oleracea var. *capitata* L.—Cultivated, without number. Local name: "Repollo."

Brassica Rapa L.—Cultivated, without number. Local name: "Nabo."

Cardamine fulcrata Greene.—In secondary thickets, at 1900 m. alt., Mt. Ovando, No. 2576.

Cardamine hirsuta L.—In open bushes, at 2300 m. alt., Pashtal, Sierra Madre, No. 1782.

Cardamine inovans O. E. Schulz.—In open bushes, at 1000 m. alt., Vol. Tacaná, Nos. 2501, 2875, 2973.

Draba volcánica Benth.—Among volcanic rocks, at 4000 m. alt., Vol. Tacaná, No. 2348.

Lepidium virginicum L.—In bushy thickets, at 3000 m. alt., Mt. Malé, No. 4592; in sandy field, at 2000 m. alt., Vol. Tacaná, No. 18288.

Nasturtium officinale R. Br.—On stream side, Siltepec, No. 1280. Local name: "Berro."

Raphanus sativus L.—Cultivated, without number. Local name: "Rabano."

CRASSULACEAE

Bryophyllum pinnatum (Lam) Kurz.—Cultivated, without number. Local name: "Siempre Vive."

Echeveria Goldmani Röse.—In wet forest, on trees, Mt. Pashtal, Sierra Madre, No. 349.

Sedum australe Rose.—In open mixed woods, Mt. Malé, at 3000 m. alt., No. 4643.

Sedum Botterii Hemsl.—In wet forest, Cerro de Laguna, Mapastepec, No. 2046; in open forest, Mt. Ovando, No. 2655; in wet forest, mostly on trees, Siltepec, No. 350; in forest, Vol. Tacaná, No. 2955.

SAXIFRAGACEAE

Hydrangea macrophylla (Thunb.) DC.—Cultivated, Escuintla, No. 16850. Local name: "Hortensia."

Philadelphus Matudai Lundell, Contr. Univ. Mich. Herb. 4: 6. 1940.—In edge of forest, Vol. Tacaná, at 1400 m. alt., near Unión Juárez (T. L.), No. 2791. Local name: "Mosqueta." Doubtful species.

Philadelphus myrtoides Bertol.—In open, wet forest, Hierba Buena, Siltepec, No. 1701.

Phyllonoma laticuspis (Turcz.) Engler.—In mixed wet forest, Mt. Ovando, No. 483; in mixed forest, at 1500 m. alt., Vol. Tacaná, Nos. 2394, 2824; in cloud forest, at 2300 m. alt., Frailesca, Siltepec, Nos. 15293, 1580; in cloud forest, at 2300 m. alt., Saxchanal, Sierra Madre, No. 17815.

Ribes ciliatum Humb & Bonpl.—In second growth, Vol. Tacaná, north slope; at 2500 m. alt., No. 2361.

BRUNELLIACEAE

Brunellia mexicana Standl.—In wet woods, Vol. Tacaná, at 1500 m. alt., No. 2442.

CUNONIACEAE

Weinmannia pinnata L.—In open forest, Saxchanal, Sierra Madre, No. 4285; in stony thickets, Vol. Tacaná, No. 2887; in wet thickets, Pashtal, at 2000 m. alt., No. 403; in woods, Boqueron, Motozintla, No. 5371.

HAMAMELIDACEAE

Liquidambar styraciflua L.—In advanced forest, 1500 m. alt., Cerro de Laguna, Mapastepec, No. 1157. Local name: "Liquidambar."

Matudaea trinervia Lundell, Lloydia 3: 210. 1940.—In advanced forest, at 1900 m. alt., Mt. Ovando (type locality), Nos. 1843, 3984; in edge of forest, Rodeo, Siltepec, one branch of Sierra Madre, No. 4582; in cloud forest, between Peña de Flor and Tres Cruces, at 2000 m. alt., in Sierra Madre, No. 5042. New genus.

PLATANACEAE

Platanus chiapensis Standl.—In wet ravine or on brook side, at 1500 m. alt., Cascada, Siltepec, No. 5124; on river side, at 600 m. alt., Piñuela, Escuintla, No. 17567.

Platanus Lindeniana Mart. & Gal.—In open ravine or in river bank woods, Siltepec, No. 607. Doubtful species.

ROSACEAE

Acaena elongata L.—In grassy thickets, Mt. Pashtal, No. 1692; in wet stony thickets, Vol. Tacaná, at 3000-4000 m. alt., No. 2376; in open woods, at 2700 m. alt., Niquivil, No. 5495.

Agrimonia gryposepala Wallr.—On grassy brook side, Finca Juárez, Escuintla, No. 1771.

Alchemilla orbiculata Ruiz & Pavon.—In grassy woods, Mt. Pashtal, No. 999; in stony grassy thickets, at 3000-4000 m. alt., Vol. Tacaná, Nos. 2376, 2963.

Alchemilla pectinata HBK.—In grassy field, Niquivil, No. 5486.

Alchemilla pinnata Ruiz & Pavon.—In stony dry soil, at 4000 m. alt., Vol. Tacaná, No. 2375.

Alchemilla sibbaldiaefolia HBK.—In pine woods, Vol. Tacaná, Nos. 2377, 2857; in stony pine woods, at 2300 m. alt., Mt. Malé, No. 4631; in wet shaded woods, Mt. Ovando, at 2000 m. alt., No. 18204.

Alchemilla sibbaldiaefolia var. *Tonduzii* Perry.—In wet thickets, Siltepec, No. 1714.

Chrysobalanus icaco L.—Cultivated in Escuintla, No. 3132. Local name: "Icaco."

Couepia polyandra (HBK.) Rose.—In woods, Cacaluta, Escuintla, No. 16500; in dry forest, Escuintla, No. 1690. Local name: "Zapotillo." Previously distributed as *C. dodecandra* (DC.) Hemsl.

Hirtella racemosa Lam.—In wet forest, Mt. Ovando, Nos. 681, 4137; in mixed woods, Siltepec, No. 388; in woods, Jilguero, Escuintla, Nos. 16454, 16887.

Hirtella triandra Swartz.—In sandy woods, Cruz de Piedra, Acacoyagua, No. 17627; in woods, at 1500 m. alt., Mt. Ovando, No. 6071.

Holodiscus argenteus (L. f.) Maxim.—On dry stony ridge, at 1600 m. alt., Cascada, Siltepec, Nos. 5172, 5055; on sunny ridge, at 2000 m. alt., Mt. Pashtal, No. 17684. On sunny, limestone ridge, at 2200 m. alt., Mt. Ovando, No. 16214.

Holodiscus argenteus var. *Matudai* Ley., Bull. Torrey Club 70: 286. 1943.—On stony ridge, at 3000 m. alt., Vol. Tacaná (type locality), No. 2803.

Holodiscus fissus (Lindl.) Schneid.—On stony ridge, Mt. Ovando, No. 2580; on grassy, sunny ridge, Mt. Pashtal, No. 404, on stony or rocky ridge, at 2000-3000 m. alt., Saxchanal, Sierra Madre, No. 4301.

Licania platypus (Hemsl.) Fritsch.—In wet sandy forest, Acacoyagua, No. 16450; in woods, Cacaluta, Escuintla, No. 16380. Local name: "Subzapote."

Malus pumila Miller.—Cultivated only in La Grandeza, without number. Local name: "Manzana."

Photinia Matudai Lundell, Contr. Univ. Mich Herb. 4: 7. 1940.—In wet forest, Pico de Loro, No. 4283; in mixed forest, Vol. Tacaná, No. 2937 (type locality), Mt. Pashtal, No. 402; in mixed forest, at 1500-2500 m. alt., Siltepec, No. 410; in wet forest, Niquivil, near Guatemalan border, No. 5503; in forest, Boqueron, No. 5340.

Potentilla heterosepala Fritsch.—In stony, open soil, Vol. Tacaná, near peak, Nos. 2374, 2875.

Prunus annularis Koehne.—In dense forest, Mt. Pashtal, No. 391; in virgin forest, at 2500 m. alt., Saxchanal, Sierra Madre, No. 4300.

Prunus barbata Koehne.—In wet forest, at 2500 m. alt., Pinabeto, Motozintla, No. 5468.

Prunus brachybotrya Zucc.—In wet woods, at 3000 m. alt., Mt. Malé, No. 4667; in

forest, Ventana, Siltepec, No. 4536; in wet forest, Niquivil, No. 5491. Local name: "Cerezo."

Prunus Capuli Cav.—In wet forest, at 3200 m. alt., Mt. Malé, Porvenir, No. 4689; in woods, at 2000 m. alt., Cascada, Siltepec, No. 5179.

Prunus guatemalensis I. M. Johnston.—In wet forest, at 1900 m. alt., Ventana, Siltepec, No. 4546; in forest, at 2000 m. alt., La Gradeza, No. 5545.

Prunus Lundelliana Standl. Field. Mus. Bot. 22: 77. 1940.—In dense forest, Hacienda, Siltepec, No. 1906 (type locality); in advanced forest, Santa Rita, Mapastepec, No. 2016.

Prunus Matudai Lundell, Phytologia 1: 369. 1940.—In wet forest, at 1000-2000 m. alt., Vol. Tacaná (type locality), No. 2453.

Prunus Persica (L.) Stokes.—Cultivated at 2000-3000 m. alt., without number. Local name: "Durazno".

Prunus Skutchii I. M. Johnstone.—In wet forest, at 1200 m. alt., near Las Nubes, Mt. Ovando, No. 16246.

Prunus tetradenia Kochne.—In wet woods, Letrero, Siltepec, No. 4337.

Pyrus communis L.—Cultivated only in La Grandeza, without number. Local name: "Pera."

Rosa chinensis Jacq.—Cultivated in garden, No. 1376. Local name: "Rosa."

Rosa multiflora Thunb.—Cultivated, without number. Local name: "Rosa."

Rubus adenotrichos Schlecht.—In sunny second growth, Pinada, Siltepec, No. 1912; in second growth, at 1000-1200 m. alt., Mt. Ovando, No. 4220. Local name: "Mora," "Salsa."

Rubus trichomallus Schlecht.—In second growth, at 1000-1500 m. alt., Pinada, Siltepec, No. 1901.

Rubus trilobus Seringe.—In rocky thickets, at 2000-3000 m. alt., Vol. Tacaná, Nos. 2516, 18203.

Rubus urticaefolius Poir.—In second growth bushes, at 100 m. alt., Mt. Ovando, No. 963.

CONNARACEAE

Connarus lentiginosus Brandeg.—In woods, Esperanza, Escuintla, No. 2295; in sunny bushes, Jilguero, Escuintla, Nos. 16473, 16427, 16537, 17512, 17016. Local name: "Bejuco colorado."

Rourea glabra H.B.K.—In open thickets, Las Garzas, near Acapetahua, Nos. 2699, 2737, 16650; on stream bank, Acacoyagua, No. 16509. Local name: "Bejuco de Agua."

LEGUMINOSAE

Acacia acatolensis Benth.—In second growth, Siltepec, No. 1584.

Acacia angustissima (Mill) Kuntze.—In second growth, Escuintla, Nos. 31, 17074; in edge of coffee plantation, Finca Juárez, No. 1757; in open pine woods, Barranca Honda, Siltepec, No. 4050; in second growth, Mt. Ovando, No. 3975.

Acacia Farnesiana (L.) Wild.—In bushes, near beach, Paredon, Tonalá, Nos. 16305, 17104, 17359. Local name: "Huizachi."

Acacia Hindsii Benth.—In secondary thickets, Esperanza, Escuintla, No. 17459. Local name: "Ishcanal."

Acacia paniculata Willd.—On open ridge, at 2000 m. alt., Mt. Ovando, No. 1842.

Acacia pennatula (Schl. & Cham.) Benth.—In sunny open woods, at 2000 m. alt., La Grandeza, N. 5592; in open woods, at 2100 m. alt., La Grandeza, No. 5544.

Acacia polypodioides Standl.—In bushes, near beach, Paredon, Tonalá, No. 16311.

Acacia riparis H.B.K.—In secondary thickets, at 2000 m. alt., Mt. Ovando, No. 2536.

Acacia riparioides (Britt. & Rose) Standl.—In uncultivated field, Esperanza, Escuintla, No. 5596.

Acacia tacanensis Lundell, in Sched.—In grassy thickets, near Unión Juárez, Vol. Tacaná (type locality), No. 2768.

Aeschynomene americana L.—In sunny grassy second growth, Barranca Honda, Siltepec, No. 4101; in sunny grassy field, Escuintla, Nos. 53, 2164.

Aeschynomene hispida Sw.—In sunny grassy field, Escuintla, Nos. 44, 2121.

Aeschynomene paniculata Willd.—In savanna field, at 700 m. alt., Chicomuselo, No. 4478.

Aeschynomene virginica (L.) Bsp.—In wet field, Cerrito, Acapetahua, No. 16755.

Albizia adinocephala (Donn. Smith) Britt. & Rose.—In forest, La Grada, Escuintla, Nos. 16725, 17060, 16986. Local name: "Chipilon."

Albizia Lebbeck (L.) Benth.—In sandy woods, probably escaped, Arista, Tonalá, No. 17328. Mostly cultivated for roadside tree.

Amicia zygoensis DC.—In grassy, sunny pine woods, Barranca Honda, Siltepec, No. 4031.

Arachis hypogaea L.—Cultivated, Mazapa, No. 4830.

Ateleia pterocarpus DC.—In open forest, Siltepec, No. 1588.

Bauhinia divaricata L.—In edge of dry forest, at 1300 m. alt., Estacado, Mapastepec, No. 4034.

Bauhinia hondurensis Standl.—In bushes, Turquia, Escuintla, No. 17089.

Bauhinia purpurea L.—Cultivated in garden, Esperanza, Escuintla, No. 16559. Imported from Hongkong.

Bauhinia Seleriana Harms.—In secondary thickets, Siltepec, No. 1628.

Bauhinia Standleyi Rose.—In secondary thickets, Escuintla, Nos. 47, 66.

Bauhinia unguilata L.—In bushes or in meadow, Esperanza, Escuintla, No. 60; in sandy bushy area, Sta. Elena, Acapetahua, No. 17277; in sandy woods, Mojarra, Tonalá, No. 17237. Local name: "Pie de Venado."

Benthmanantha panamensis Rydberg.—In sandy field, Escuintla, No. 32.

Caesalpinia crista L.—In sandy thickets, near beach, Las Garzas, Acapetahua, No. 2732; on sandy beach, Mojarra, Tonalá, No. 17146.

Caesalpinia pulcherrima (L.) Swartz.—Cultivated in garden, Escuintla, No. 16373. Local name: "Barba de Sol."

Calliandra confusa Sprague & Riley.—In sunny growth, Finca Juárez, Escuintla, No. 64; in open woods, Nuevo Amatenango, No. 4717; in second growth, Mt. Ovando, No. 4169; in sunny bushy area, Jilguero, Escuintla, Nos. 17261, 17018.

Calliandra chiapensis (B. & R.) Lundell, Phytologia 1: 369. 1940.—In edge of forest, Acacoyagua, Escuintla (type locality), No. 2608. Local name: "Tamarindo de Monte."

Calliandra emarginata (Humb. & Bonpl.) Benth.—In woods, Honduras, Siltepec, No. 4394.

Calliandra Houstoniana (Mill.) Standl.—On wet river bank, Barranca Honda, Siltepec, No. 4027; in second growth, Cascada, Siltepec, No. 5087.

Calliandra Matudai Lundell, Lloydia 2: 88. 1939.—In open stony woods, at 1500 m. alt., Buena Vista, Escuintla (type locality), No. 1888.

Calliandra siltepecensis Lundell, Phytologia 2: 1. 1941.—In bushes on river bank, Barranca Honda, Siltepec (type locality), No. 4040.

Calliandra tetragona (Willd.) Benth.—In open thickets, Escuintla, Nos. 30, 17073; in wet thickets, Motozintla, No. 4887; in second growth, Mt. Ovando, No. 16192.

Calopogonium brachycarpum Benth.—In secondary thickets, Escuintla, No. 14.

Calopogonium caeruleum (Benth.) Hemsl.—In secondary thickets, Escuintla, No. 10.

Calopogonium lanceolatum Brandeg.—In wet thickets, Barranca Honda, Siltepec, No. 4072.

Canavalia hirsuta (M. & G.) Standl.—In woods, at 2000 m. alt., Mt. Ovando, No. 2575; in woods, La Grandeza, No. 5539.

Canavalia mexicana Piper.—In open thickets, at 1800 m. alt., Mt. Ovando, No. 17270; in sunny bushy area, Mojarra, Tonalá, No. 17326.

Canavalia villosa Benth.—In woods, Santa Rosa, Escuintla, No. 4259; in thickets, Nuevo Amatenango, No. 4794; in thickets, Mazapa, No. 4846; in open woods, Cascada, Siltepec, Nos. 1726, 5145; in woods or thickets, Escuintla, Nos. 503, 32; in open woods, Barranca Honda, Siltepec, at 1300 m. alt., No. 4026.

Cassia bacillaris L. f.—In open secondary thickets, Acacoyagua, Nos. 592, 16550, 17412. Local name: "Candela Patria"; in bushes, Mojarra, Tonalá, No. 17128. Local name: "Chaperna blanca."

Cassia bicapsularis L.—In bushes, Escuintla, No. 2108.

Cassia biflora L.—In riverside woods, Barranca Honda, Siltepec, Nos. 4049, 1911; on brook side, Escuintla, Nos. 17018, 68; in thickets, Paredon, Tonalá, Nos. 16300, 17316, 13337. Local name: "Ronron."

Cassia chamaecristoides Collad.—In grassy pine woods, Monte Cristo, No. 1978.

Cassia diphylla L.—In river side, Cacaluta, near Col. Hidalgo, Acacoyagua, No. 16980; on grassy beach, Las Garzas, near Acapetahua, No. 2740; in sandy field, near beach, Arista, Tonalá, No. 17363.

Cassia emarginata L.—In woods, near beach, Paredon, Tonalá, No. 16357.

Cassia hispidula Vahl.—In savanna field, Chicomuselo, No. 4422.

Cassia guatemalensis Donn. Smith.—In second growth, at 2500 m. alt., Pinabeto, No. 5475.

Cassia indecora HBK.—In thickets, Escuintla, No. 28.

Cassia laevigata Willd.—In second growth, at 2000 m. alt., near Ojo de Agua, Saxchanal, Sierra Made, Nos. 17814, 1678.

Cassia leiophylla Vogel.—In second growth, Escuintla, No. 11; in thickets, at 900 m. alt., Mt. Ovando, No. 6168.

Cassia leptocarpa Benth.—In secondary bushes, Escuintla, No. 40; in sunny, sandy field, Mojarra, Tonalá, No. 17131.

Cassia leptocarpa var. *hirsuta* Benth.—In field, at 2500 m. alt., Tabla, Siltepec, No. 1708; in woods, at 2600 m. alt., Mt. Pashtal, No. 1681.

Cassia nicaraguensis Benth.—In wet thickets, Cascada, Siltepec, No. 1620; in open wet woods, at 2015 m. alt., La Grandeza, N. 5587.

Cassia occidentalis L.—In open field, Esperanza, Escuintla, No. 6085.

Cassia oxyphylla Kunth.—In open bushes, Acacoyagua, Escuintla, No. 29.

Cassia pilosa L.—On sunny ground, at brookside, Escuintla, No. 45.

Cassia Plumieri Benth.—In open bushes, Acacoyagua, Escuintla, No. 16.

Cassia reticulata Willd.—On sandy river bank, Acacoyagua, Escuintla, No. 48; in wet sunny bushy area, Jilguero, Escuintla, No. 17287. Local name: "Tortuga."

Cassia rufa Mart. & Gal.—On brook side, wet ground, Acacoyagua, Escuintla, Nos. 23, 27.

Cassia siamea Lam.—Cultivated in Finca Esperanza, Escuintla, No. 16539. Imported from Formosa.

Cassia simplex Standl.—In grassy field, Sta. Elena, Acapetahua, No. 16687.

Cassia stenocarpa Vogel.—On brook side, wet grassland, Acacoyagua, Escuintla, Nos. 2122, 17018; in thickets, near beach, Paredon, Tonalá, No. 16892.

Cassia tomentosa L. f.—In second growth, Mt. Pashtal, No. 1870; in secondary thickets, at 2700 m. alt., or more, Vol. Tacaná, No. 2425; in second growth, Pinabeto, No. 15425. Local name: "Retamalo." (In Tacaná).

Cassia Tora L.—In second growth (old field), at 1200 m. alt., Mt. Ovando, No. 16222.

Centrosema angustifolium (HBK.) Benth.—In grassy field, Sta. Elena, Acapetahua, No. 17249; in savanna field, Chicomuselo, No. 18274.

Centrosema virginianum (L.) Benth.—In dry thickets, Mazapa de Madero, No. 4828; in open thickets, Escuintla, Nos. 17095, 12; in sunny field, Mojarra, Tonalá, No. 17107.

Chaetocalyx Matudai Lundell, Contr. Univ. Mich. Herb. 6: 26. 1941.—In sunny, sandy riverside thickets, Escuintla (type locality), No. 834.

Clitoria guyanensis (Aubl.) Benth.—In pine woods, at 1600 m. alt., Montecristo, No. 5935. New to Mexican flora.

Clitoria multiflora Mart. & Gal.—In woods, Nuevo Amatenango, No. 4771.

Clitoria ternatea L.—Cultivated widely, Escuintla, No. 16425. Local name: "Choreque."

Cologania intermedia HBK.—In open woods, at 1900 m. alt., Mt. Ovando, No. 5.

Cologania procumbens Kunth.—In open thickets, Honduras, Siltepec, Nos. 4419, 4897.

Cologania pulchella HBK.—In open bushes, at 2000 m. alt., Vol. Tacaná, No. 2483.

Crotalaria longirostrata Hook & Arn.—In second growth, at 1200 m. alt., Mt. Ovando, No. 6136.

Crotalaria maypurensis HBK.—In open field, Motozintla, No. 4805; in grassy second growth, Mt. Pashtal, No. 1660; in open field, Esperanza, Escuintla, No. 42; on river side, Cintalapa, Escuintla, No. 16985.

Crotalaria pumila Ortega.—In pine woods, Mt. Pashtal, No. 2265.

Crotalaria rotundifolia (Walt.) Poir.—In pine woods, at 1500-2500 m. alt., Mt. Pashtal, No. 73.

Crotalaria sagittalis L.—In field, Paredon, Tonalá, No. 16307.

Crotalaria Schiediana Steud.—In woods, Mt. Ovando, No. 4007; in open mixed woods, Mt. Pashtal, No. 67.

Crotalaria vitellina Ker.—In pine woods, at 2000 m. alt., Mt. Ovando, Nos. 2585, 6178, 6138. Local name: "Chipilín de Monte."

Dalbergia glabra (Mill.) Standl.—In wet forest, on river side, Malpaso, Siltepec, No. 4528.

Dalbergia tucurensis Donn. Smith.—In wet woods, Cacaluta, Escuintla, Nos. 16464, 16519. Local name: "Corazon bonito."

Dalea annua (Mill.) Kuntze.—In sandy field, Tonalá, No. 17327.

Dalea caudata (Rydb.) Bullock.—In sandy thickets, Jilguero, Escuintla, No. 17270.

Dalea lagopus (Cav.) Willd.—In grassy field, Siltepec, No. 810. Previously distributed as "*Parosela lagopus* Cav."

Delonix regia (Bojer) Raf.—Cultivated, Acacoyagua, No. 16611. Local name: "Mambroyán"; in sandy woods, probably escaped, Arista, Tonalá, No. 17368.

Desmodium affine Schl.—In wet thickets, Escuintla, No. 1866.

Desmodium barbatum (L.) Benth. & Oerst.—On sandy river bank, Cintalapa, Escuintla, No. 54.

Desmodium canum (I. Gmel.) Schinz & Thell.—In wet margin of forest, Esperanza, Escuintla, No. 18273; in field, Honduras, Siltepec, No. 4894.

Desmodium cinerascens Gray.—In grassy field, Escuintla, No. 38.

Desmodium cordistipulum Hemsl.—In wet thickets, Barranca Honda, Siltepec, No. 4097.

Desmodium distortum (Aubl.) Macbride.—In open pine woods, Mt. Ovando, No. 6182.

- Desmodium foliosum* Hemsl.—In open mixed woods, Miramar, Escuintla, No. 65; in grassy pine woods, Monte Cristo, No. 1974.
- Desmodium infractum* DC.—In open field, Escuintla, Nos. 2123, 17056, 17040; in sunny thickets, Mojarra, Tonalá, No. 17167.
- Desmodium intortum* (Mill.) Urban.—In sunny bushy area, Triunfo, Escuintla, No. 69; in sunny thickets, Mt. Pashtal, No. 74.
- Desmodium Matudai* Lundell in Sched.—In thickets, at 1000-2000 m. alt., Vol. Tacaná (type locality), No. 2414.
- Desmodium Palmeri* Hemsl.—In edge of forest, Escuintla, No. 3.
- Desmodium plicatum* Schl. & Cham.—In pine woods, Monte Cristo, No. 1983.
- Desmodium prehensile* Schlecht.—In open pine woods, Nuevo Amatenango, No. 4755.
- Desmodium procumbens* var. *longipes* (Schindl.) Schubert.—In dry edge of forest, Barranca Honda, Siltepec, No. 4136; in sandy thickets, Esperanza, Escuintla, No. 17181.
- Desmodium purpureum* (Mill) F. & R.—In field, Escuintla, No. 171.
- Desmodium Skinneri* Benth.—In woods, Frailesca, Siltepec, No. 5217; in open field, at 1600 m. alt., Cascada, Siltepec, No. 5088.
- Desmodium spirale* Bigel.—In grassy thickets, Escuintla, No. 486.
- Desmodium triflorum* (L.) DC.—In grassy field, Mojarra, Tonalá, No. 7105.
- Diphysa robinoides* Benth.—In stony sunny woods, Esperanza, Escuintla, Nos. 41, 17097. Local name: "Guachipilín."
- Diphysa spinosa* Rydb.—In sunny woods, Letrero, Siltepec, No. 4352.
- Entada patens* (Hook. & Arn.) Standl.—In bushes, Esperanza, Escuintla, Nos. 17303, 599; in woods, at 1000 m. alt., Mt. Ovando, No. 6184.
- Entada polystachia* (L.) DC.—Woody vine; in sandy thickets, Barranca Honda, Siltepec, No. 4141; in bushes, Esperanza, Escuintla, No. 16453. Local name: "Cepillon"; in bushes, Mojarra, Tonalá, No. 17164.
- Enterolobium cyclocarpum* (Jacq.) Griseb.—In sandy woods, common in 100-700 m. alt., near Acacoyagua, No. 17533. Local name: "Guanacaste."
- Eriosema diffusum* (HBK.) G. Don.—In open pine woods, Nuevo Amatenango, No. 746.
- Eriosema pulchellum* (HBK.) G. Don.—In sandy grassy field, Chicomuselo, No. 4485; in grassy field, Nandolopez, Acapetahua, No. 16644.
- Erythrina mexicana* Krukoff.—Cultivated for fence, near Escuintla, No. 17601. Local name: "Zumpante."
- Eysenhardtia adenostylis* Baillon.—In thickets, Barranca Honda, Siltepec, No. 4129; in open thickets, Pashtal, No. 1654.
- Galactia acuminata* Steyerl. Field Mus. Bot. 22: 238. 1940.—In open thickets, Finca Juárez, Escuintla (type locality), No. 1741.
- Gliricidia sepium* (Jacq.) Steud.—In sandy open field or woods, Esperanza, Escuintla, No. 15; in woods, San Luis, Siltepec, No. 5323. Local name: "Yaite," "Madre de Cacao."
- Hymenaea Courbaril* L.—In sandy forest, Escuintla, No. 1426. Local name: "Guapinaol."
- Indigofera lespedezioides* HBK.—In grassy savannaland, Chicomuselo, Nos. 4426, 4481; in grassy field, Nandolopez, Acapetahua, No. 16654.
- Indigofera Matudai* Lundell, Amer. Midl. Nat. 19: 428. 1938.—In grassy thickets, Finca Juárez, No. 1758 (type locality), in secondary thickets, Letrero, Siltepec, No. 4345, in thickets, Barranca Honda, Siltepec, No. 4122.
- Indigofera mucronata* Spreng.—In bushes, at 1700 m. alt., Mt. Pashtal, No. 1657; in shaded margin of woods, Mojarra, Tonalá, No. 17169.
- Indigofera suffruticosa* Mill.—In sunny grassy thickets, Mazapa, No. 4820; in sunny

bushy area, Escuintla, No. 506; in thickets, Mojarra, Tonalá, No. 17157. Local name: "Añil de Monte."

Inga Calderoni Standl.—In thickets, Santa Rosa, near Escuintla, No. 423.

Inga Cookii Pittier.—Cultivated, without number. Local name: "Cuil Macheton."

Inga edulis Mart.—In sandy brookside bushes, Acacoyagua, No. 22; on river side, Chicomuselo, No. 4477. Local name: "Cuil de Agua."

Inga laurina (Sw.) Willd.—In wet woods, Acacoyagua, Nos. 1862, 46. Local name: "Caspirol."

Inga leptoloba Schlecht.—In forest, Salina, Siltepec, No. 1915; in open woods, Mt. Ovande, No. 6046.

Inga Micheliana Harms.—In open woods, Acacoyagua, No. 22. Local name: "Chalum."

Inga Paterno Harms.—In wet woods, Acacoyagua, Nos. 2075, 16496. Local name: "Cuil Macheton."

Inga Pringlei Harms.—In dry forest, Buena Vista, Escuintla, No. 1899.

Inga spuria Humb. & Bonpl.—In riverside woods, Esperanza, Escuintla, No. 17640. Local name: "Cuil de Agua."

Leucaena Shannoni Donn. Sm.—In sandy woods, in lowland no more than 400 m. alt., without number. Local name: "Guaje."

Lonchocarpus apricus Lundell, Lloydia 2: 90. 1939.—In open sunny woods, Esperanza, Escuintla (type locality), Nos. 2620, 4020; in sandy, sunny woods, Malpaso, Siltepec, No. 4525.

Lonchocarpus chiapensis Lundell, Wrightia 1: 152. 1946.—In sunny second growth, Piñuela, Escuintla (type locality), No. 5008.

Lonchocarpus cochleatus Pitt.—In wet woods, Acacoyagua, Escuintla, No. 2109. Local name: "Lombricero."

Lonchocarpus hondurensis Benth.—In wet sandy woods, Esperanza, Escuintla, Nos. 1088, 17638. Local name: "Chaperna."

Lonchocarpus latifolius (Willd.) H.B.K.—In woods, Paredon, Tonalá, No. 16319.

Lonchocarpus minimiflorus Donn. Sm.—In sandy, sunny woods, Escuintla, No. 1801; in woods, Mt. Ovando, No. 16223; in woods, near beach, Mojarra, Tonalá, No. 171662; in woods, Acacoyagua, No. 16835.

Lonchocarpus Salvinii Harms.—In sandy woods, Piñuela, Escuintla, No. 1139.

Lotus mexicanus (Benth.) Morton.—In grassy field, Siltepec, No. 2233.

Lotus repens (G. Don.) Sessé & Moc.—In pine woods, Mt. Pashtal, No. 1704.

Lupinus vaginatus Cham. & Schul.—In stony field, at 3000-4000 m. alt., Vol. Tacaná, No. 2333.

Lysiloma auritum (Schlecht.) Benth.—In open woods, at 2000 m. alt., Frailesca, Siltepec, No. 15272.

Lysiloma microphylla Benth.—In sandy sunny thickets, Motozintla, No. 4824.

Machaerium arboreum (Jacq.) Vog.—In sunny woods, Esperanza, Escuintla, Nos. 16600, 16772. Local name: "Chapulín."

Machaerium biovulatum Micheli.—In open sandy woods, Sta. Rosa, Tonalá, No. 17339; in dry woods, Escuintla, No. 18202; in secondary thickets, at 1300 m. alt., San Luis, Siltepec, No. 5981; in thickets, Acacoyagua, Nos. 17390, 2060.

Machaerium cobanense Donn. Sm.—In secondary thickets, Barranca Honda, Siltepec, No. 4121.

Machaerium latifolium (Benth.) Pittier.—In sandy bushy area, Mazapa, No. 4869; in sandy secondary thickets, Escuintla, No. 2613.

Machaerium riparium Brandeg.—In bushes, Escuintla, No. 71. Local name: "Uña de Gato."

Machaerum setulosum Pitt.—In bushes, Esperanza, Escuintla, Nos. 2032, 17437. Local name: "Uña de Gato."

Mimosa albida Hum. & Bonpl.—In sunny second growth, Mt. Ovando, No. 21; in sunny bushy area, Escuintla, Nos. 59, 17058. Local name: "Sarza."

Mimosa Maxonii Standl.—In bushes, Escuintla, No. 8. Local name: "Sarza."

Mimosa pigra L. In sandy bushy area or on river bank, Escuintla, Nos. 45, 16634.

Mimosa pudica L.—Along railway, Mapastepec, No. 17522. Local name: "Ver-güenza."

Mimosa scalpens Standl.—In woods, Esperanza, Escuintla, No. 15397.

Mucuna pruriens (L.) DC.—In sandy thickets, near beach, Arista, Tonalá, No. 17312. Local name: "Gusano."

Mucuna Sloanei Fawc. & Rendle.—In sandy bushy area, Mojarra, Tonalá, No. 17239; in woods, Escuintla, No. 2116.

Myroxylon balsamum var. *Pereirae* (Rugle) Harms.—In forest, Cacaluta, Escuintla, Nos. 16554 (fl.), 16529 (fr.) Local name: "Palo de Balsamo," "Chichipate."

Neptunia prostrata (Lam.) Bailb.—In swamp, near beach, Paredón, Tonalá No. 16902.

Neptunia pubescens Benth.—In dry savannaland, Chicomuselo, Nos. 4432, 4452.

Nissolia fruticosa Jacq.—In bushes, Esperanza, Escuintla, No. 17291.

Nissolia Nelsoni Rose.—In edge of forest, Mt. Ovando, No. 3950; in open thickets, Mazapa, No. 4874; in wet thickets, Escuintla, No. 559.

Pachyrhizus erosus (L.) Urban.—In secondary thickets, at 200 m. alt., Turquia, Escuintla, No. 17035.

Parosela diffusa (Moric.) Rose.—In grassy field, Siltepec, No. 818.

Parosela nigra (M. & G.) Rose.—In grassy field, Escuintla, No. 2118; in moist grassy field, Barranca Honda, Siltepec, No. 4131.

Parosela sericea (Leg.) Rose.—In open pine woods, Monte Cristo, No. 1968.

Phaseolus atropurpureus DC.—In sunny thickets, Mojarra, Tonalá, No. 17197.

Phaseolus Buseri Micheli.—Cultivated, Acacoyagua, No. 16814. Local name: "Choreque."

Phaseolus Caracalla L.—In wet sunny bushy area, Miramar, Escuintla, No. 63; in sandy open bushy area, Mt. Ovando, No. 16059.

Phaseolus coccineus L.—In grassy field, Cascada, Siltepec, No. 1738; in grassy thickets, Vol. Tacaná, No. 2405.

Phaseolus chiapanus Piper.—In sunny thickets, Toquián, Siltepec, No. 1668; in woods, at 1200 m. alt., Mt. Ovando, No. 6174.

Phaseolus lunatus L.—Cultivated, in Cascada, Siltepec, No. 5071. Local name: "Frijol."

Phaseolus viridis Piper.—In sunny thickets, Escuintla, No. 9.

Pithecolobium arboreum (L.) Urban.—In woods, at 2100 m. alt., La Grandeza, No. 5586.

Pithecolobium Conzatti (Standl.) Standl.—In woods near beach, Las Garzas, near Acapetahua, No. 2715.

Pithecolobium dulce (Roxb.) Benth.—In woods, near beach, Paredón, Tonalá, No. 16331; in woods, Mt. Ovando, No. 6161. Local name: "Guamuti."

Pithecolobium (Cajoba) *escuintlense* Lundell, Contr. Univ. Mich. Herb. 7: 15. 1942. —in forest, at 1600 m. alt., Santa Rosa, Escuintla (type locality), No. 4260; in dry

forest, at 1800 m. alt., Frailesca, Siltepec, No. 5214; in cloud forest, at 2000 m. alt., Tres Cruces, Sierra Madre, No. 5041.

Pithecolobium lanceolatum (H. & B.) Benth.—In open woods, Belem, Mapastepec, No. 16747; in woods, Paredon, Tonalá, No. 16947.

Pithecolobium Matudai Lundell, Amer. Midl. Nat. 19: 429. 1938.—In woods, Pico de Loro, Sierra Madre, No. 4280; in woods, (type locality), at 2000 m. alt., Mt. Ovando, No. 1855.

Pithecolobium Recordii (B. & R.) Standl.—In woods, near beach, Paredon, Tonalá, No. 16289.

Pithecolobium Saman (Jacq.) Benth.—In sandy open woods, Esperanza, Escuintla, Nos. 4021, 17607. Local name: "Tepenuhuaste."

Pithecolobium siltepecense Lundell, Contr. Univ. Mich. Herb. 7: 16. 1942.—In thickets, Barranca Honda, Siltepec (type locality), No. 4132.

Platymiscium dimorphandrum Donn. Smith.—In woods, Esperanza, Escuintla, No. 17438. Local name: "Horniguillo," "Palo de Marimba."

Poepigia procera Presl.—In savanna land, Chicomuselo, No. 4453; in sandy forest, Esperanza, Escuintla, Nos. 16491, 16845. Local name: "Guaje."

Poiretia scandens Vent. In thickets, Cascada, Siltepec, No. 1618; in wet thickets, Monte Cristo, No. 1976.

Protopsis chilensis (Molina) Stuntz.—In woods near beach, Las Garzas, Acapetahua, No. 2729.

Protopsis juliflora (Swartz.) DC.—In sandy woods, Paredon, Tonalá, Nos. 16339, 16333, 17159, 17357. Local name: "Mesquite."

Pterocarpus acapulcensis Rose.—In woods, near Huixtla, No. 17615.

Rhynchosia longiracemosa Mart. & Gal.—In open bushes, Escuintla, No. 72.

Rhynchosia minima (L.) DC.—In sunny thickets, Las Garzas, near Acapetahua, No. 2716; in sandy sunny thickets, Mojarra, Tonalá, No. 17217.

Rhynchosia pyramidalis (Lam.) Urban.—In thickets, Acacoyagua, Escuintla, No. 58; in open bushes, Pinada, Siltepec, No. 1897; in bushes, at 1100 m. alt., Mt. Ovando, Nos. 6172, 17288. Local name: "Ojo de Zanate."

Schizolobium parahybum (Vell.) Blake.—In sandy woods, Acacoyagua, Escuintla, Nos. 18, 17625. Local name: "Cuchillal."

Sesbania Emerus (Aubl.) Urban.—In wet lowland, or open brook side, Acacoyagua, Escuintla, Nos. 49, 16987, 17062; in sandy field, Mojarra, Tonalá, No. 17230.

Stylosanthes guyanensis (Aubl.) Sw.—In grassy pine woods, Monte Cristo, No. 1958.

Swartzia ochracea DC.—In wet forest, at 700 m. alt., Finca Corcega, Pueblo Nuevo Comaltitlán, No. 17833; in woods, Escuintla, No. 1041.

Swartzia simplex (Swartz) Spreng.—In wet woods, Esperanza, Escuintla, 908. Local name: "Naranjillo."

Tephrosia Langlassci Micheli.—In grassy pine woods, Monte Cristo, No. 1795.

Tephrosia littoralis Pers.—In grassy field, Las Garzas, Acapetahua, No. 2733.

Tephrosia toxicaria (Sw.) Pers.—In sandy dry field, Esperanza, Escuintla, No. 17; in dry savanna land, Chicomuselo, No. 4423.

Teramnus uncinatus (L.) Swartz.—In wet field, Arista, Tonalá, No. 17318.

Thornbera Dalea (L.) Rydb.—In pine woods, Mt. Pashtal, Nos. 757, 792.

Trifolium amabile HBK.—In open field, Escuintla, No. 26; in grassy field, Siltepec, No. 1702; in open grassy field, Mt. Malé, No. 4676.

Zornia diphylla (L.) Pers.—In savanna field, Chicomuselo, No. 4482; in field, Barranca Honda, Siltepec, No. 4043; wet grassy field, Siltepec, No. 1716.

GERANIACEAE

Geranium bellum Rose.—In wet pine woods, Mt. Malé, No. 4705.

Geranium mexicanum HBK.—In open wet grassy field, Mt. Ovando, No. 966. Local name: "Mano de Leon."

Pelargonium hortorum L.—Cultivated in indoor garden at Siltepec, Porvenir, without number. Local name: "Geranio."

OXALIDACEAE

Biophytum dendroides (HBK.) DC.—In field, Escuintla, No. 881; in edge woods, at 1600 m. alt., Santa Rosa, Escuintla, No. 4251.

Oxalis acuminata Schl. & Cham.—In open pine woods, Mt. Pashtal, No. 1067.

Oxalis Neaei DC.—In sandy field, Honduras, Siltepec, No. 4404; in sunny field, Escuintla, No. 951. Local name: "Destempla Dientes."

Oxalis rhombifolia Jacq.—In wet thickets or in edge of forest, Caleras, Motozintla, No. 15513; in wet thickets, Nuevo Amatenango, No. 4730; in wet thickets, at 1600 m. alt., Cascada, Siltepec, No. 5123.

ERYTHROXYLACEAE

Erythroxylon areolatum L.—In open woods, at 800 m. alt., Venustiano Carranza, No. 5902.

Erythroxylon tabascense Britton.—In wet forest, Buena Vista, Escuintla, No. 1875; in forest, Mt. Pashtal, No. 460; in advanced forest, at 1500-2000 m. alt., Mt. Ovando, Nos. 1816, 17581; in woods, Acacoyagua, No. 16480; in upper course of Cacaluta River, Escuintla, No. 17550.

ZYGOPHYLLACEAE

Kallstroemia maxima Torr. & Gray.—On sandy sunny brook side, Mazapa, No. 4831.

RUTACEAE

Amyris elemifera L.—In dry forest, Chicomuselo, No. 5638.

Casimiroa edulis Llave & Lax.—In woods, Siltepec, at 1600 m. alt., No. 817.

Casimiroa tetramaria Millsp.—In woods, Mt. Ovando, No. 2544; in woods, at 1300 m. alt., Barranca Honda, Siltepec, Nos. 4045, 817. Local name: "Matasano."

Citrus aurantifolia (Cristm.) Swingle.—Cultivated generally. Local name: "Limón."

Citrus Aurantium L.—Cultivated. Local name: "Naranja Agria."

Citrus Limetta Risso.—Cultivated generally. Local name: "Lima dulce."

Citrus Limonia Osbeck.—Cultivated. Local name: "Limón Real."

Citrus maxima (Burm.) Merrill.—Cultivated. Local name: "Toronja."

Citrus maxima form. *Buntan* (Hayata) Hort.—Cultivated in Finca Esperanza, Escuintla, imported from Formosa.

Citrus medica L.—Cultivated. Local name: "Sidra."

Citrus nobilis Lour. var. *deliciosa* (Tenore) Swingle.—Cultivated. Local name: "Mandarina," without number.

Citrus sinensis (L.) Osbeck.—Cultivated. Local name: "Naranja dulce," without number.

Murraya paniculata (L.) Jack.—Cultivated without number. Local name "Muraya," without number.

Peltostigma pteleoides (Hook.) Walp.—In advanced forest, Ventana, Siltepec, No. 4550; in forest, La Grandeza, No. 5568.

Ruta chalepensis L.—Cultivated, Buena Vista, Escuintla, No. 1886. Local name: "Ruda."

Triphasia trifolia (Burn. f.) P. Wilson.—Cultivated mostly in gardens, Esperanza, Escuintla, No. 16588. Local name: "Limoncilla."

Zanthoxylon citroides Standl. Field Mus. Bot. 22: 85. 1940.—In edge of forest, at 1800 m. alt., Vol. Tacaná (type locality), No. 2961.

Zanthoxylon Harmsianum (Loes.) P. Wilson.—In woods, at 2800 m. alt., Vol. Tacaná, No. 2918; in sunny woods, at 1200-1500 m. alt., Mt. Ovando, No. 896; in woods, Niquivil, No. 5490; new to Mexican flora, previously reported only from Guatemala.

Zanthoxylon Matudai Lundell, Amer. Midl. Nat. 20: 236. 1938.—In dry thickets, Finca Suiza, Montecristo (type locality), No. 1920; in open woods, Cacaluta, Acacoyagua, No. 16889.

Zanthoxylon mayanum Standl.—In open woods, La Grada, Escuintla, Nos. 16734, 16398. Local name: "Rabolagarto."

Zanthoxylon melanostictum Cham. & Schl.—In woods, at 1800 m. alt., Mt. Ovando, Nos. 2078, 3921.

Zanthoxylon microcarpum Griseb.—In bushes, Barranca Honda, Siltepec, No. 4107; in dry thickets, Malpaso, Siltepec, No. 4517; in woods, Cacaluta, Escuintla, No. 16677. Local name: "Rabolagarto."

Zanthoxylon mollissimum (Engler.) P. Wilson.—In dry bushes, Mazapa de Madero, No. 4854.

Zanthoxylon suaveolens Lundell, Amer. Midl. Nat. 20: 237. 1938.—In wet thickets, Montecristo (type locality), No. 1933; in dry Letrero, Siltepec, No. 4348.

SIMARUBACEAE

Alvaradoa amorphoides Liebm.—In savanna thickets, Chicomuselo, No. 4505; in sandy woods, Sta. Rosa, Tonalá, Nos. 17345, 17121.

Picramnia antidesma Sw.—In open wet forest, Nuevo Amatenango, No. 4737; in riverside woods, Barranca Honda, Siltepec, No. 4029; in wet forest, Mt. Malé, No. 4589.

Picramnia Matudai Lundell, Phytologia 1: 241. 1937.—In advanced forest, Mt. Ovando, Escuintla (type locality), Nos. 428, 3946, 4166.

Picramnia pistaciaefolia Blake & Standl.—In wet forest, Mt. Ovando, Nos. 481, 3138 (Fr.), 3937 (Fl.).

Picramnia quaternaria Donn. Smith.—In forest, at 1800 m. alt., Mt. Ovando, No. 16266.

Picramnia teapensis Tulasne.—In woods, near beach, Cerrito, Acapetahua, No. 17713.

Picramnia velutina Lundell, Contr. Univ. Mich. Herb. 7: 17. 1942.—In forest, at 1600 m. alt., Santa Rosa, near Escuintla (type locality), No. 4229.

Quassia amara L.—In wet open thickets, Las Garzas, Acapetahua, No. 2689; in thickets, Paredon, Tonalá, No. 16287.

BURSERACEAE

Bursera bipinnata (Sessé & Moc.) Engler.—In woods, Honduras, Siltepec, No. 4401; in open woods, La Grandeza, No. 5591.

Bursera excelsa (HBK.) Engler.—In dry woods, Chicomuselo, No. 5628; in woods, near beach, Paredon, Tonalá, No. 16354.

Bursera grandifolia (Schl.) Engler.—In wet forest, Malpaso, Siltepec, No. 4531.

Bursera Schlickendalii Engler.—In riverside woods, Mazapa, No. 4822.

Bursera Simaruba (L.) Serg.—In woods, Esperanza, Escuintla, No. 16608; in dry sandy woods, Santa Rosa, Tonalá, No. 17354. Local name: "Palo Jiote," "Chocohuite."

MELIACEAE

Cedrela mexicana M. Roem.—In riverside woods, Chicomuselo, No. 4464. Local name: "Cedro." It ranges from lowland at almost sea level to 2000 m. alt.

Cedrela salvadorensis Standl.—In forest, Finca Brisa, Escuintla, No. 18322. New to Mexican flora.

Cedrela Tonduzii C. DC.—In open forest, Rodeo, Siltepec, No. 4558.

Guarea bijuga C. DC.—Niquivil, Motozintla, near Guatemalan border, at 2790 m. alt., No. 5500.

Guarea braviathera C. DC.—In forest, at 2000 m. alt., Vol. Tacaná, No. 2329.

Guarea excelsa HBK.—In sandy woods, Acacoyagua, Nos. 16619, 16639. Local name: "Trompillo de Playa."

Guarea Matudai Lundell.—In wet forest, Mt. Pashtal, No. 813; in wet forest, at 2000 m. alt., Vol. Tacaná (type locality), No. 2449.

Guarea obtusata Blake.—In wet forest, Mt. Ovando, No. 4168; in forest, Escuintla, No. 903. Local name: "Chilillo."

Guarea Trompillo C. DC.—In wet forest, Esperanza, Escuintla, No. 2616. Local name: "Trompillo." New to Mexican flora.

Melia Azerdarach L.—In sunny second growth, Cacaluta, Escuintla, No. 16376. Local name: "Granillo."

Swietenia humilis Zucc.—In open woods, Mazapa, No. 4851; in sandy woods, Arista, Tonalá, 17311; in woods, Paredon, Tonalá, No. 16947.

Trichilia cuneata Radlk.—In sandy woods, Escuintla, Nos. 914, 16360, 16435, 16469, 17643, 16403; in woods, Nuevo Amatenango, No. 4763; in brookside thickets, Chicomuselo, No. 4492.

Trichilia habanensis Jacq.—In riverside woods, Finca Suiza, Montecristo, No. 1923.

Trichilia hirta L.—In sandy woods, Escuintla, Nos. 627, 16540, 16463, 16463, 16465, 16779, 16705; in wet woods, Mazapa, No. 4884; in bushes, Paredon, Tonalá, No. 16301; in riverside woods, Chicomuselo, Nos. 4470, 4503; in open woods, at 2015 m. alt., La Grandeza, N. 5589; in sandy woods, Acacoyagua, No. 16606. Local name: "Mapahuite."

Trichilia Matudai Lundell, *Lyodia* 2: 93. 1939.—In wet forest, Mt. Madre Vieja, near Escuintla, (type locality), Nos. 2531, 16732; in forest, Cacao, Escuintla, No. 16599. Local name: "Cuil cohuite".

Trichilia parvifoliola C. DC.—In woods, Paredon, Tonalá, No. 16301.

Trichilia trifolia L.—In sandy woods, near beach, Las Garzas, Acapetahua, Nos. 2701, 16770; in woods, near beach, Mojarra, Tonalá, Nos. 17133, 16952.

MALPIGHIACEAE

Banisteria argentea (HBK.) Spreng.—Riverside woods, Jilguero, Escuintla, No. 17266; in thickets, Finca Juárez, Escuintla, No. 1744; in open sandy thickets, escuintla, No. 598. Previously distributed as "*Banisteriopsis argentea* (H.B.K.) C. B. Robinson".

Banisteria Beecheyana (A. Juss.) C. B. Robinson.—In dry woods, San Nicolás, Montecristo, No. 1960; in sunny bushy area, Siltepec, No. 4071; in woods Escuintla, No. 412.

Banisteria laurifolia L.—In bushes, Escuintla, No. 1083; in edge of forest, Esperanza, Escuintla, No. 2027; in sunny thickets, Honduras, Siltepec, No. 4417.

Bunchosia biocellata Schlecht.—In sandy bushy area, Arista, Tonalá, Nos. 17325, 17148; in woods, Sta. Elena, Acapetahua, No. 17252.

Bunchosia guatemalensis Niedenzu.—In wet woods, Escuintla, Nos. 1796, 16667, 16552; in woods, Acapetahua, Nos. 16780, 17548; in woods, Huixtla, No. 17612. Local name: "Fruta de Chacha".

Bunchosia lanceolata Turcz.—In woods, Esperanza, Escuintla, No. 511; in forest,

Mt. Ovando, Nos. 567, 16216; in open thickets, Escuintla, Nos. 1636, 2609; in woods, at 1500 m. alt., Montecristo, No. 5946.

Bunchosia macrophylla Rose.—In wet thickets, San Vicente, Tapachula, No. 2510.

Bunchosia Matudai Lundell, Contr. Univ. Mich. Herb. 6: 37. 1941.—In wet forest, at 2000 m. alt., Mt. Ovando (type locality), Nos. 3924, 3983.

Bunchosia montana Juss.—In secondary woods, Siltepec, No. 1856.

Brysonima crassifolia (L.) HBK.—In open grassy land, Santa Rosa, near Escuintla, No. 662. Local name: "Nanche." Cultivated generally on Pacific Coast.

Gaudichaudia albidia Cham. & Schlacht.—In bushes, Siltepec, Nos. 1578, 8081, 5134; in secondary thickets, Escuintla, No. 998.

Heteropteris Beecheyana Juss.—In woods, at 150 m. alt., Acacoyagua, No. 17397.

Heteropteris laurifolia (L.) Juss. In bushes, at 500 m. alt., Piñuela, 32 km. northeast of Escuintla, No. 17564.

Hiraea obovata (HBK.) Niedenzu.—In dry woods, Escuintla, Nos. 2181, 17052; in riverside woods, at Calicante, near Acacoyagua, No. 17526.

Hiraea velutina Niedenzu.—In forest, at 1800 m. alt., Mt. Ovando, No. 1840; in forest, Chicomuselo, No. 5650.

Malpighia glabra L.—In wet forest, Mt. Pashtal, No. 1658; in forest, Cacaluta, Escuintla, Nos. 17063, 16859; in woods, Barranca Honda, Siltepec, No. 4042; in sandy woods, Jilguero, Escuintla, No. 16476. Local name: "Escobo blanco."

Mascagnia malpighioides (Turcz.) Morton.—In forest, Mt. Ovando, Nos. 478, 2643; in wet forest, Saxchanal, No. 4305.

Mascagnia ovatifolia (HBK.) Griseb.—In forest edge, Esperanza, Escuintla, Nos. 868, 2629; in sandy thickets, Escuintla, No. 2182.

Mascagnia polycarpa Brandeg.—In mixed forest, Caleras, Motozintla, No. 5510.

Mascagnia sepium (Juss.) Griseb.—In bushes, Piñuela, at 1300 m. alt., Escuintla, No. 17575.

Stigmaphyllon Lindenianum Juss.—In secondary thickets, Escuintla, No. 2182.

Stigmaphyllon puberum (L. Rich.) Juss.—In woods, at 1900 m. alt., Mt. Ovando, Nos. 2660, 2661.

Tetrapteris discolor (G. F. W. Mey.) DC.—In woods, Escuintla, No. 489; in forest Palestina, Escuintla, No. 1876; in forest, at 700-1200 m. alt., Mt. Ovando, No. 434.

Tetrapteris discolor var. *lanuginosa* Niedenzu.—In forest, Mt. Pashtal, No. 720; in open area, at 1000-2000 m. alt., Mt. Ovando, No. 2640; in bushes, at 500 m. alt., Piñuela, Escuintla, Nos. 17574, 17353.

Thryallis glauca (Cav.) Kuntze.—In secondary growth, Miramar, Escuintla, No. 395; in open woods, near La Nuves, Mt. Ovando, No. 16240.

Thryallis gracilis (Bartl.) Kuntze.—In second growth, at 1300 m. alt., Las Cadenas, near Escuintla, No. 1878.

TRIGONIAEAE

Trigonía floribunda Oerst.—A woody vine, in woods, at 1000 m. alt., Mt. Madre Vieja, near Escuintla, N. 2517; in sunny secondary thickets, Acacoyagua, No. 16548. Known from Central America, new to Mexican flora.

Trigonía rasa Standl. & Steyerl.—In secondary thickets, at Cruz de Piedra, Acacoyagua, No. 17630. Reported from Guatemala, new to Mexican flora.

POLYGALACEAE

Monnina xalapensis H.B.K.—In grassy thickets, Mt. Pashtal, No. 464; in pine woods, Mt. Malé, No. 4598; in sunny secondary thickets, near Col. Chiquihuite, Vol. Tacaná, No. 2841; in sunny grassy thickets, Pinabeto, No. 5427.

Polygala biformipilis Blake.—In wet open field, at 1000-1500 m. alt., Vol. Tacaná, No. 2488.

Polygala bryzoides St. Hil.—In field, Nandolopez, Acapetahua, No. 16653.

Polygala floribunda Benth.—In field, Frailesca, Siltepec, No. 5210; in grassy field, Mt. Pashtal, No. 62; in wet open field, Barranca Honda, Siltepec, No. 4051; in field, La Grandeza, No. 5540.

Polygala paniculata L.—In grassy field, Siltepec, No. 1715; in wet field, San Vicente, Tapachula, No. 2514; in brookside field, Unión Juárez, No. 2758.

Polygala paniculata f. *leucoptera* Blake.—In wet field, Siltepec, No. 1583.

Securidaca diversifolia (L.) Blake.—In pine woods, Mt. Ovando, No. 1841; in grassy thickets, Santa Rita, Mapastepec, No. 2012; in secondary grassy thickets, Estacado, Mapastepec, No. 2026; in thickets, at 2000 m. alt., Frailesca, Siltepec, No. 15261; in grassy thickets, near beach, Belem, Mapastepec, No. 17591.

DICHAPETALACEAE

Dichapetalum chiapense Standl. Field Mus. Bot. 17: 176. 1937.—In secondary woods, at 2000 m. alt., Mt. Ovando (type locality), Nos. 679, 4006, 4208.

Dichapetalum Donnell-Smithii Engler.—In secondary woods, Escuintla, No. 645; in sandy bushy area, Esperanza, Escuintla, Nos. 5420, 5419, 17617. Local name: "Duras-nito." New to Mexican flora.

EUPHORBIACEAE

Acalypha alopecuroides Jacq.—In open thickets, Acocoyagua, Escuintla, No. 949. Local name: "Cancer."

Acalypha arvensis Poepp. & Endl.—In roadside bushes, Nuevo Amatenango, No. 4780; in grassy thickets, Mojarra, Tonalá, No. 17171.

Acalypha diversifolia Jacq.—In secondary thickets, Siltepec, No. 281.

Acalypha macrostachya var. *macrophylla* (H.B.K.) Muell. Arg.—In secondary thickets, at 1700 m. alt., Mt. Pashtal, No. 280.

Acalypha Matudai Lundell, Contr. Univ. Mich. Herb. 4: 10. 1940.—In wet thickets, Acapetahua (type locality), No. 2717; in wet thickets, Malpaso, Siltepec, No. 4520.

Acalypha mollis HBK.—In open bushes, Boqueron, No. 5381.

Acalypha nicaraguensis Pax & Hoffm.—In thickets, near beach, Paredon, Tonalá, No. 16313.

Acalypha parvifolia M. Arg.—In field, Mojarra, Tonalá, No. 17118.

Acalypha polystachya Jacq.—In wet shaded thickets, near beach, Mojarra, Tonalá, No. 17235.

Acalypha Schiedeana Schlecht.—In roadside thickets, Acocoyagua, No. 16478.

Acalypha Schlumbergeri Muell. Arg.—In sunny thickets, Chicomuselo, No. 4507.

Acalypha setosa A. Rich.—In secondary thickets, Mt. Malé, No. 4655.

Acalypha tacanensis Lundell, Contr. Univ. Mich. Herb. 4: 11. 1940.—In second growth, near Unión Juárez, Vol. Tacaná (type locality), No. 2786.

Acalypha unibracteata Muell. Arg.—In secondary thickets, Mt. Ovando, No. 562; in open bushes, Chicomuselo, No. 5642.

Acalypha villosa Jacq.—In riverside woods, Malpaso, Siltepec, No. 4530.

Acalypha Wilkesiana Muell. Arg.—Cultivated, Esperanza, Escuintla, No. 16545. Local name: "Payacito."

Adelia parvinervis S. & C.—In woods, Esperanza, Escuintla, No. 2745; in wet woods, Mt. Pashtal, No. 457; in woods, at 700 m. alt., Piñuelo, Escuintla, No. 17569.

Alchornea latifolia Sw.—In woods, Triunfo, Escuintla, No. 1007; in forest, Esperanza, at 300 m. alt., Escuintla, No. 17436. Local name: "Canaco."

- Bernardia interrupta* Muell. Arg.—In secondary woods, Mt. Pashtal, No. 455.
- Bernardia mollis* Lundell, Contr. Univ. Mich. Herb. 4: 12. 1940.—In second growth woods, at 2000 m. alt., north slope, Vol. Tacaná (type locality), No. 2966; in open woods, Boqueron, No. 15390.
- Bernardia mollis* var. *lanceifolia*, Lundell, Contr. Univ. Mich. Herb. 4: 13. 1940.—In second growth woods, at north slope, Vol. Tacaná (type locality), No. 2978.
- Bernardia oblanceolata* Lundell, Contr. Univ. Mich. Herb. 4: 13. 1940.—In edge of forest, Hacienda, Siltepec (type locality), No. 1891; in second growth woods, Mt. Ovando, Nos. 4148, 17728.
- Caperonia castaneifolia* St. Hil.—In secondary thickets, Mt. Madre Vieja, Escuintla, No. 2530.
- Caperonia palustris* (L.) St. Hil.—In wet grassy field, Nandolopez, Acapetahua, No. 16649; in thickets, Paredon, Tonalá, No. 16893.
- Cnidoscolus Chayamansa* McVough.—Cultivated, Esperanza, Escuintla, No. 17610. Local name: "Chaya."
- Cnidoscolus multilobus* (Pax) I. M. Johnston.—In second growth woods, Tuixcum, Motozintla, No. 5538.
- Cnidoscolus tubulosus* (Muell. Arg.) I. M. Johnstone.—In second growth, at 1500 m. alt., Mt. Ovando, Nos. 17755, 2568.
- Croton arboreus* Millsp.—In sunny woods, Santa Rosa, Escuintla, No. 4262. Local name: "Copalchi."
- Croton chiapensis* Lundell, Contr. Univ. Mich. Herb. 7: 18. 1942.—In sandy thickets, at 160 m. alt., Escuintla (type locality), No. 2614.
- Croton fragilis* HBK.—In sandy bushy area, Escuintla, No. 16414.
- Croton glabellus* L.—In open bushes, San Vicente, Tapachula, No. 2509.
- Croton glandulosus* L.—In savanna land, Chicomuselo, No. 4448.
- Croton guatemalensis* Lotsoy.—In woods, Acacoyagua, Nos. 15336, 17616; in woods, Huixtla, No. 17611; in woods, San Luis, Siltepec, No. 5327; in woods, at 1800 m. alt., Frailesca, Siltepec, No. 5208.
- Croton lobatus* L.—In sunny second growth, Escuintla, No. 953.
- Croton mazapensis* Lundell, Contr. Univ. Mich. Herb. 7: 19. 1942.—In open field, Mazapa de Madero (type locality), No. 4834.
- Croton niveus* Jacq.—In woods, Esperanza, Escuintla, No. 16366. Local name: "Copalchi."
- Croton pendens* Lundell, Contr. Univ. Mich. Herb. 7: 20. 1942.—In grassy oak woods, Honduras, Siltepec (type locality), No. 4373.
- Croton platyphyllus* Lundell, Contr. Univ. Mich. Herb. 7: 21. 1942.—In second growth, Siltepec (type locality), No. 282.
- Croton repens* Schl.—In grassy oak woods, Honduras, Siltepec, No. 4402.
- Croton siltepecensis* Lundell, Contr. Univ. Mich. Herb. 7: 22. 1942.—In second growth, Letrero, Siltepec (type locality), Nos. 4329, 4331.
- Croton subfragilis* Muell. Arg. In sunny second growth, Honduras, Siltepec, No. 4400.
- Croton tacanensis* Lundell, Phytologia 1: 450: 1940.—In secondary thickets, Vol. Tacaná (type locality), No. 2943.
- Croton viifolius* Lundell, Contr. Univ. Mich. Herb. 7: 23. 1942.—In open thickets, Honduras, Siltepec, Nos. 4391, 4410; in secondary thickets, Mazapa (type locality), Nos. 4832, 4833.
- Dalechampia panamensis* Pax & Hoffm.—In bushes, Cacaluta, Acacoyagua, No. 17018.
- Dalechampia scandens* L.—In secondary bushes, Esperanza, Escuintla, No. 2173.
- Dalechampia tiliaefolia* Lam.—In thickets, Turquia, Escuintla, No. 17101.

Ditaxis guatemalensis (Muell. Arg.) Pax & Hoffm.—In sandy thickets, Paredon, Tonalá, No. 16349.

Euphorbia brasiliensis Lam.—In uncultivated, sunny field, Escuintla, No. 264; in grassy field, Mojarra, Tonalá, No. 17227; in woods, Cacaluta, Acacoyagua, No. 16839.

Euphorbia collectioides Benth.—In wet forest, Mt. Pashtal, No. 1002.

Euphorbia fulva Stapf.—In dry woods, Mazapa, Nos. 4844, 4836.

Euphorbia graminea Jacq.—In grassy field, Mojarra, Tonalá, No. 17232; in thickets, at 900 m. alt., Nuevo Amatenango, No. 4753.

Euphorbia heterophylla L.—In open field, near beach, Paredon, Tonalá, No. 17023; in open thickets, Escuintla, No. 276; in sunny open field, Nuevo Amatenango, No. 4731; in wet grassy field, Sta. Elena, Acapetahua, No. 16682.

Euphorbia hirta L.—In wet uncultivated field, Escuintla, No. 269.

Euphorbia hyssopifolia L.—In field, Mazapa, No. 4826.

Euphorbia Peplus L.—In wet field, Escuintla, No. 2264.

Euphorbia pulcherrima Willd.—In wet ravine, Barranca Honda, Siltepec, No. 4057; in brookside woods, at 1200 m. alt., Mt. Ovando, No. 2082; also generally cultivated in gardens. Local name: "Árbol de Noche Buena."

Euphorbia scabrella Boiss.—In woods, at 1300 m. alt., San Luis, Siltepec, No. 5319.

Euphorbia splendens Bojer.—Cultivated, Escuintla, No. 17702. Local name: "Corona de Espina."

Garcia nutans Vahl.—In fencerow, wet sandy soil, Castaño, Escuintla, Nos. 2061, 2619, 6037; in woods, Belem, Mapastepec, No. 16734.

Hura polyandra Baill.—In riverside savanna land, Chicomusel, No. 4472. Local name: "Haba."

Jatropha curcas L.—In fencerow, Esperanza, Escuintla, No. 2618; cultivated, often escaped. Local name: "Piñon."

Jatropha sp.—In second growth, Acacoyagua, Escuintla, No. 284. Local name: "Mala Mujer."

Julocroton argenteus Didr.—In thickets, Las Garzas, Acapetahua, No. 2713; along road side, Tapachula, No. 17705.

Mabea excelsa Standl. & Steyerl.—In forest, Huicisil, Mt. Madre Vieja, No. 16728. Local name: "Lechero." Known from Guatemala, new to Mexican flora.

Mabea occidentalis Benth.—In wet woods, Escuintla, Nos. 490, 17055, 17421.

Manihot angustifolia (Torr.) Muell. Arg.—In grassy field, Honduras, Siltepec, No. 4392; in grassy field, Siltepec, No. 1665.

Manihot carthaginensis (Jacq.) Muell. Arg.—In sandy, sunny thickets, Motozintla, No. 4813.

Manihot gualanensis Blake.—In second growth, Cacaluta, Escuintla, No. 16375; in bushes, Islamapa, Huehuetan, No. 18013. Local name: "Yucca simarron."

Manihot esculenta Crautz.—Cultivated, without number. Local name: "Yuca."

Omphalea oleifera Hemsl.—In sandy woods, Nueva Libertad, Acacoyagua, Nos. 16591, 17414. Local name: "Aguacate de Danta."

Phyllanthus acidus (L.) Skeels.—In woods, near beach, Paredon, Tonalá, No. 16274, 16929.

Phyllanthus antianus (A. Juss.) Muell. Arg.—In brookside thickets, Nuevo Amatenango, No. 4760.

Phyllanthus brasiliensis (Aubl.) Poir.—In sandy bushy area, Cacaluta, Escuintla, No. 16533; in woods, Nandolopez, Acapetahua, No. 16652.

Phyllanthus lathyroides HBK.—In open woods, at about 900 m. alt., Mt. Ovando, No. 6141.

Phyllanthus Niruri L.—In sunny field, Escuintla, No. 263.

Phyllanthus nobilis (L. f.) Muell. Arg.—In secondary woods, Escuintla, No. 2602; in sandy sunny bushy area, Jilguero, Escuintla, No. 16443. Local name: "Garbansillo."

Phyllanthus nobilis var. *hypomalacus* Standl.—In bushes, Col. Soconusco, Acapetahua, No. 16502. Local name: "Garbansillo."

Phyllanthus Purpusii Brandeg.—In open forest, Siltepec, No. 819; in woods, at 1500 m. alt., Mt. Ovando, No. 523. In sunny second growth, Boqueron, Motozintla, No. 153380.

Ricinus communis L.—In second growth, sandy sunny soil, Escuintla, No. 17537. Local name: "Higuerilla."

Sapium lateriflorum Hemsl.—In woods, at 1200 m. alt., Mt. Ovando, No. 16371.

Sapium macrocarpum Muell. Arg.—In forest, Turquia, Escuintla, No. 17099. Local name: "Chonte."

Sapium mexicanum Hemsl.—In advanced forest, Barranca Honda, Siltepec, No. 4142.

Stillingia acutifolia Benth.—In pine woods, at 1300 m. alt., Montecristo, No. 5944; in sunny thickets, Siltepec, No. 1683.

Tetrorchidium rotundatum Standl.—In wet woods, Esperanza, Escuintla, Nos. 120, 16399, 16813, 17011. Local name: "Amate blanco."

Tragia volubilis L.—In thickets, at 1000 m. alt., Mt. Ovando, No. 16238; in thickets, Chicomuselo, No. 4497.

CORIARIACEAE

Coriaria thymifolia H. & B.—In open woods, 1500 m., alt., Vol. Tacaná, No. 2417; in open thickets, Pashtal, No. 461; in open thickets, Unión Juárez, No. 2778.

ANACARDIACEAE

Anacardium occidentale L.—Cultivated, often escaped, Esperanza, Escuintla, No. 17458. Local name: "Marañón."

Astronium graveolens Jacq.—In sandy forest, Cacaluta, Escuintla, No. 16451. Local name: "Ronron."

Mangifera indica L.—Cultivated, often escaped, Escuintla, No. 17374. Local name: "Mango."

Mauria sessiliflora Standl.—In forest, at 1600 m. alt., Frailesca, Siltepec, No. 5197.

Rhus costaricensis R.—In sunny thickets, Barranca Honda, Siltepec, No. 4048.

Rhus terebinthifolia Schl. & Cham.—In sunny thickets, Cascada, Siltepec, Nos. 1671, 18213.

Rhus vestita Loes.—In thickets, at 1600 m. alt., Cascada, Siltepec, No. 5160.

Schinus molle L.—In sunny woods, Mazapa, No. 4815. Local name: "Sauce Lloron," "Perú."

Spondias Mombin L.—In sandy woods, Esperanza, Escuintla, Nos. 2617, 16668. Local name: "Jobo."

Spondias purpurea L.—In roadside fencerow, Acacoyagua, No. 17624; in house fence, Escuintla, Nos. 17663, 17578 (corona); 17598.

Toxicodendron striatum (Ruiz & Pavón) Kuntze.—In open woods, at 1900 m. alt., Mt. Ovando, Nos. 2547, 3934 (Fr.), 4187 (Fl.).

AQUIFOLIACEAE

Ilex chiapensis Lundell.—In forest, at 2016 m. alt., La Grandeza (type locality), No. 5556.

Ilex gracilipes I. M. Johnston.—In wet forest, at 1600 m. alt., Cascada, Siltepec, No. 5061; in wet forest, Siltepec, No. 5618.

Ilex Liebmannii Standl.—In forest, Letrero, Siltepec, No. 4361.

Ilex Matudai Standl. in sched. at Chicago Nat. Hist. Mus.—In forest, at 2500 m. alt., Pinabeto (type locality), No. 15463.

Ilex tolucana Hemsl.—In forest, at 2500 m. alt., Pinabeto, near Guatemalan border, No. 5439; in forest, at 2500 m. alt., Mt. Pashtal, No. 469.

CELASTRACEAE

Celastrus chiapensis Lundell, Lilloa 4: 380. 1939.—In advanced forest, at 1900 m. alt., Mt. Ovando (type locality), Nos. 529, 2080 (fl.), No. 3944 (fr.).

Celastrus siltepecanus Lund. Wrightia 1: 155. 1946.—In forest, Frailesca, Siltepec (type locality), No. 5192.

Celastrus vulcanicolus Donn. Sm.—In wet forest at 1500 m. alt., Mt. Ovando, No. 1834.

Gyminda Tonduzii Loes.—In woods, Barranca Honda, Siltepec, No. 4033; in forest, Santa Rosa, near Escuintla, No. 4257.

Maytenus chiapensis Lundell, Wrightia 1: 156. 1946.—In second growth, Piñuela, Escuintla (type locality), No. 5011.

Maytenus Matudai Lundell, Lilloa 4: 383. 1939.—In forest, north slope, Vol. Tacaná (type locality), No. 2983.

Maytenus trichotomus Turcz.—In forest, Cascada, at 1500 m. alt., Siltepec, No. 5148.

Microtropis contracta Lundell, Wrightia 1: 159. 1946.—In wet forest, Mt. Pashtal (type locality), No. 450.

Perrotetia longistylis Rose.—In wet ravine, at 2200 m. alt., Mt. Ovando, No. 3982; in wet woods, Cascada, at 1600 m. alt., Siltepec, No. 1638; in forest, at 2000 m. alt., Vol. Tacaná, No. 2429. Local name: "Palo de Agua."

Rhcoma riparia Lundell.—In woods, Paredon, Tonalá, No. 16334.

Zinowiewia Matudai Lundell, Bull. Torrey Bot. Club 65: 472. 1938.—In forest, Mt. Ovando, No. 424; in open forest, Buena Vista, Escuintla (type locality), No. 1872; in advanced forest, 1500-2000 m. alt., Siltepec, No. 4596; in forest, at 2400 m. alt., Boqueron, No. 15351; in forest, at 2000 m. alt., Frailesca, Siltepec, No. 5203.

Zinowiewia tacanensis Lundell, Lloydia 2: 101. 1939.—In advanced forest, at 2000 m. alt., Vol. Tacaná (type locality), No. 2455.

HIPPOCRATEACEAE

Hemiangium excelsum (H.B.K.) A. C. Sm.—In open ravine, Nuevo Amatenango, No. 4788.

Hippocratea celestroides H.B.K.—In wet forest, Santa Rita, Mapatepec, No. 1991; in sandy woods, Paredon, Tonalá, No. 16334-B.

Salacia sp.—In forest, at 1300 m. alt., Mt. Ovando, No. 518.

STAPHYLEACEAE

Turpinia occidentalis (Sw.) G. Don.—In wet forest, Mt. Ovando, Nos. 2545 (fl.), 2658 (fr.); in forest, Siltepec, No. 820; in woods, Niquivil, near Guatemalan border, No. 5489; in woods, Cacaluta, Escuintla, Nos. 16680, 16731. Local name: "Manzanilla."

Turpinia paniculata Vent.—In dense forest, Mt. Ovando, No. 4165; in wet forest, Escuintla, No. 626.

Turpinia sp.—In wet forest, at 3000 m. alt., Mt. Malé, No. 4612.

Turpinia tricornuta Lundell, Bull. Torrey Club 66: 598. 1939.—In forest, at 2100 m. alt., north slope, Vol. Tacaná (type locality), No. 2941.

ICACINACEAE

Oecopetalum mexicanum Greenm. & Thoms.—In virgin forest, at 2000 m. alt., Vol. Tacaná, No. 2437.

ACERACEAE

Acer serratum Pax.—In forest near Rodeo, Siltepec, No. 407.

Acer Negundo var. *orizabense* (Rydb.) Standl. & Steyerl.—In forest, Boqueron and Niquivil, No. 5364. Local name: "Icoj." Reported from Guatemala, new to Mexican flora.

HIPPOCASTANACEAE

Billia hippocastanum Peyr.—In wet forest, Mt. Ovando, Nos. 416, 2638 (fr.), 4213; at wet ravine, Mt. Pashtal, No. 1003; in mixed forest, at 3000 m. alt., Vol. Tacaná, No. 2390. Local name: "Jaboncillo."

SAPINDACEAE

Allophylus occidentalis (Sw.) Radlk.—In forest, Escuintla, No. 638.

Allophylus psilospermus Radlk.—In bushy area, Jilguero, Escuintla, No. 16477; in bushes, Acacoyagua, Nos. 17767, 17508; in woods, at 1000 m. alt., Mt. Ovando, No. 17764.

Cardiospermum corindum L.—In grassy wet field, Sta. Elena, Acapetahua, No. 16689.

Cardiospermum grandiflorum L.—In sandy thickets, Escuintla, No. 601.

Cupania belizensis Standl.—In forest, Santa Rosa, Escuintla, No. 4251; in forest, Cascada, Siltepec, No. 1723.

Cupania glabra Sw.—In woods, Esperanza, Escuintla, No. 17293. Local name: "Cola de Pava".

Cupania macrophylla A. Rich.—In woods, Escuintla, Nos. 2606 (fl.), 2607 (fr.).

Dodonaea viscosa Jacq.—In sunny thickets, Santa Rita, Mapastepec, No. 2015.

Matayba clavelligera Radlk.—In forest, Esperanza, Escuintla, Nos. 6078, 16472, 10790, 16786.

Paullinia fuscescens H. B. K.—In second growth, Estacado, Mapastepec, No. 2024.

Paullinia pinnata L.—In sunny secondary thickets, Esperanza, Escuintla, Nos. 16547, 16979; in thickets, Paredon, Tonalá, No. 16897.

Paullinia tomentosa Jacq.—In thickets, Escuintla, No. 525.

Paullinia turbacensis HBK.—On brook side, near Salto de Agua, north slope of Mt. Ovando, at 600 m. alt., No. 16367.

Sapindus saponaria L.—In woods, at 200 m. alt., Tetreor, Siltepec, No. 4344; in woods, Acacoyagua, Escuintla, No. 602; in sandy thickets, Santa Rosa, Tonalá, Nos. 17338, 17194.

Serjania brachystachya Radlk.—In sunny thickets, Escuintla, No. 487.

Serjania caracasana (Jacq.) Willd.—In sunny thickets, Escuintla, No. 2261.

Serjania cardiospermoides Schlecht. & Cham.—In bushes, Finca Juárez, Escuintla, No. 1742; in second growth, Finca Suiza, Monte Cristo, No. 1916; in thickets, Escuintla, No. 565; in sunny thickets, Mazapa, No. 4870.

Serjania goniocarpa Radlk.—In open bushes, Esperanza, Escuintla, No. 16499; in thickets, Mojarra, Tonalá, No. 17124.

Serjania racemosa Schum.—In bushes, Finca Olvido, Montecristo, No. 1926; in edge of open forest, at about 1000 m. alt., Mt. Ovando, No. 4013.

Serjania rhachiptera Radlk.—In open woods, Calera, Motozintla, 5516.

Serjania triquetra Radlk.—In sunny thickets, Escuintla, No. 453; in sunny bushy area, Jilguero, Escuintla, No. 17269.

Thouinidium decandrum (H. & B.) Radlk.—In sandy woods, Cintalapa, Escuintla, No. 16362; in riverside woods, at 1000 m. alt., Piñuela, Escuintla, No. 17562.

SABIACEAE

Meliosma Matudai Lundell, Phytologia 1: 243. 1937.—In wet forest, Mt. Ovando, No. 526 (fl.); in forest, Santa Rosa, Escuintla, No. 4265 (fr.); in advanced wet forest, Cerro Laguna, Mapastepec (type locality), No. 2045.

RHAMNACEAE

Ceanothus coeruleus Lag.—On sunny rocky ridge, at 3000 m. alt., Mt. Malé, No. 4586; on sunny rocky ridge, at 2450 m. alt., Boqueron, Motozintla, No. 15366.

Colubrina ferruginosa Brongn.—In sandy woods, Triunfo, Escuintla, No. 16459; cultivated, Acacoyagua, Nos. 16601, 17769. Local name: "Cascalote."

Colubrina mollis Lundell, Contr. Univ. Mich. Herb. 8: 75. 1942.—In dry sandy thickets, Mazapa (type locality), No. 48173.

Gouania lupuloides (L.) Urban.—In sandy thickets, Escuintla, No. 484; in bushes, near beach, Mojarra, Tonalá, Nos. 17119, 17668; in thickets, at 1500 m. alt., Mt. Ovando, No. 17046.

Gouania polygama (Jacq.) Urban.—In sunny thickets, Acacoyagua, Escuintla, Nos. 2285, 17301, 17054, 17039; in bushes, Paredon, Tonalá, No. 16966. Local name: "Bejuco de Jiote."

Karwinskia Calderonii Standl.—In open woods, Siltepec, No. 5612.

Karwinskia puberula Lundell, in Sched.—In savanna land, Chicomuselo (type locality), No. 4460.

Rhamnus discolor (D. Sm.) Rose.—In forest, at 2000 m. alt., Vol. Tacaná, Nos. 2800, 2968; in woods, Mt. Ovando, No. 3980; in woods, Unión Juárez, No. 2800; in woods, La Grandeza, No. 5581; at 2500 m. alt., in woods, Pinabeto, No. 5479; in woods, Boqueron, No. 15370.

Rhamnus capreaefolia Schlecht.—In woods, at 2000 m. alt., La Grandeza, No. 15541.

Rhamnus Pringlei Rose.—In bushes, Chicomuselo, No. 15626.

VITACEAE

Ampelocissus acapulcensis (H.B.K.) Planch.—In sandy sunny soil, Escuintla, No. 17664.

Cissus Martiniana Woodson & Seibert.—In thickets, Barranca Honda, Siltepec, No. 4082; in woods, at 2600 m. alt., Tres Cruces, No. 5033.

Cissus gossypifolia Standl.—In thickets, Escuintla, No. 2166.

Cissus rhombifolia Vahl.—In bushes, Escuintla, Nos. 2166, 16394; in thickets, Chicomuselo, No. 4490; in field or thickets, Nandolopez, Acapetahua, No. 16655. Local name: "Come mano de llano."

Cissus sicyoides L.—In thickets, Esperanza, Escuintla, Nos. 911, 16630; in thickets, near beach, Cerrito, Acapetahua, No. 16762.

Vitis caribaea DC.—In second growth, at 2700 m. alt., Mt. Malé, No. 4709.

Vitis tiliifolia Humb. & Bonpl.—In dry thickets, Escuintla, No. 637; in thickets, Acapetahua, Nos. 16546, 16586. Local name: "Uva de monte."

ELAEocarpaceae

Sloanea quadrivalvis Seem.—In sunny woods, Ulapa, Mapastepec, No. 1998. Local name: "Caquito."

Sloanea terniflora (Sessé & Moc.) Standl.—In wet woods, Esperanza, Escuintla, No. 17448; in woods, Mt. Pashtal, No. 1073.

TILIACEAE

Apeiba Tibourbou Aubl.—In second growth, Cacaluta, Escuintla, No. 16571. Local name: "Peine de Mico."

Belotia mexicana (DC.) K. Schum.—In second growth, Escuintla, Nos. 2136, 16815; in forest, Santa Isabel, Motozintla, No. 16421. Local name: "Capulin."

Corchorus aestuans L.—In thickets, Paredon, near beach, Tonalá, No. 16906.

Corchorus orinocensis HBK.—In field, Paredon, Tonalá, No. 16320.

Corchorus siliquosus L.—In wet grassy field, Mojarra, Tonalá, No. 17216.

Heliocarpus Donnell-Smithii Rose.—In bushes, at 150 m. alt., Esperanza, Escuintla, No. 2148; in woods, Finca Suiza, Montecristo, No. 1921; in bushes, Esperanza, Escuintla, Nos. 17380, 17407.

Heliocarpus gladioliferus Robinson.—In open second growth woods, at 1000 m. alt., south slope, Mt. Ovando, No. 16220.

Heliocarpus mexicanus (Turez.) Sprague.—In open woods, at 1000 m. alt., Mt. Ovando, No. 17048.

Heliocarpus reticulatus Rose.—In second growth bushes, Sta. Rosa, Tonalá, Nos. 17342, 17136.

Luehea candida (DC.) Mart.—In brookside, sandy woods, Escuintla, Nos. 102, 16541, 16521; in woods, near beach, Mojarra, Tonalá, No. 17155. Local name: "Cuautle blanco."

Luehea speciosa Willd.—In sandy woods, Chicomuselo, No. 4499; in brookside, sandy woods, Escuintla, N. 107.

Muntingia Calabura L.—In secondary thickets, Esperanza, Escuintla, No. 510. Local name: "Capulin."

Triunfetta dumetorum Schl.—In wet field, Esperanza, Escuintla, No. 99.

Triunfetta insignis Watson.—In savanna thickets, Chicomuselo, No. 4436.

Triunfetta lappula L.—In wet field, Esperanza, Escuintla, No. 97; in field, Mojarra, Tonalá, No. 17115.

Triunfetta mexicana Turcz.—In wet field, Esperanza, Escuintla, No. 488.

Triunfetta semitriloba Jacq.—In wet field, Barranca Honda, Siltepec, No. 4052.

Triunfetta speciosa Seem.—In wet thickets, Siltepec, No. 1581; in clouded forest, at 2500 m. alt., Mt. Pashtal, No. 18179; in open woods, at 1800 m. alt., Hacienda, 60 km. north of Escuintla, No. 5988.

MALVACEAE

Abutilon Andrieuxii Hemsl.—In thickets, Paredon, Tonalá, No. 16340.

Abutilon Hemsleyanum Rose.—In thickets, Mt. Pashtal, No. 87; in wet woods, Pinada, Siltepec, No. 1905.

Abutilon hirtum (Lam.) Sw.—In woods, Finca Suiza, Montecristo, No. 1919.

Abutilon Nelsoni Rose.—In open woods, Esquipula, Cerro de Laguna, Mapastepec, No. 2039.

Abutilon Pachecoanum Standl. & Steyererm.—In open field, at 2000 m. alt., Mt. Pashtal, No. 89; in thickets, at 1700 m. alt., Siltepec, No. 1592. Known from Guatemala, new to Mexican flora.

Abutilon Purpusii Standl.—In open forest, Mt. Pashtal, No. 85.

Anoda cristata (L.) Schl.—In thickets, Cascada, Siltepec, No. 80.

Cayoides crispum (L.) Small.—In sandy thickets, Mazapa, No. 4857.

Gossypium mexicanum Tod.—In thickets, probably escaped, Mojarra, Tonalá, No. 17224.

Hibiscus bifurcatus Cav.—In open thickets, Miramar, Escuintla, No. 101; in thickets, Mt. Ovando, No. 3977; in open woods, at 1600 m. alt., Frailesca, Siltepec, No. 15253.

Hibiscus cannabinus L.—Cultivated, Acacoyagua, No. 18181. Local name: "Clavelina."

Hibiscus furcellatus Lam.—In field, Ranchoquemado, Acapetahua, No. 17399.

Hibiscus rosa-sinensis L.—Generally cultivated in garden. Local name: "Clavel," "Tulipan."

Hibiscus Sabdariffa L.—In sandy field, probably escaped, Arista, Tonalá, No. 17330.

Hibiscus tiliaceus L.—In bushes, Acapetahua, No. 2730.

Kosteletzkya hastata Presl.—In bushes, Las Garzas, Acapetahua, No. 2770.

Kosteletzkya pentasperma (Bert.) Griseb.—In field, near beach, Paredon, Tonalá, No. 16915; in thickets, Las Garzas, Acapetahua, No. 2712.

Kosteletzkya sagittata Presl.—In bushes, near beach, Las Garzas, Acapetahua, No. 2712.

Malachra alceifolia Jacq.—In thickets, Las Garzas, Acapetahua, No. 2691.

Malva parviflora L.—In second growth, at 2700 m. alt., south slope, Vol. Tacaná, near Col. Chiquihuite, No. 2836; in thickets, in 1900 m. alt., Mt. Ovando, No. 100.

Malvaviscus arboreus Cav.—In woods, Esperanza, Escuintla, No. 16789.

Malvaviscus arboreus var. *mexicanus* Schlecht.—In wet woods, San Luis, Siltepec, No. 5972; in woods, Esperanza, Escuintla, No. 15349; in open woods, Boqueron, Motozintla, No. 5357; in thickets, Paredon, Tonalá, No. 16912; in woods, at 1000 m. alt., Cascada, Siltepec, No. 5051.

Malvaviscus Drummondii Torr. & Gray.—In bushes, Nuevo Amatenango, No. 4724.

Malvaviscus grandiflorus H.B.K.—In thickets, Miramar, Escuintla, No. 83.

Malvaviscus populifolius Presl.—In open thickets, at 1800 m. alt., Mt. Ovando, No. 3960; in thickets, Escuintla, Nos. 95, 2123.

Neobrittonia acerifolia (Lag.) Hochr.—In grassy thickets, Mt. Pashtal, No. 84.

Pavonia paniculata Cav.—In grassy thickets, Acacoyagua, Nos. 17243, 90.

Pseudobitton spicatum (H.B.K.) Fries.—In sunny thickets, Escuintla, Nos. 88, 17100. Local name: "Grano Amarillo."

Robinsonella edentula Rose & D. Sm.—In wet ravine, Cascada, Siltepec, No. 86. Known from Guatemala, new to Mexican flora.

Sida acuta Burm.—In open field, San Luis, Siltepec, at 1300 m. alt., No. 5296.

Sida decumbens St. Hil. & Naud.—In sunny thickets, Esperanza, Escuintla, No. 98.

Sida cordifolia L.—In grassy pine woods, Mt. Ovando, No. 93.

Sida glomerata Cav.—In waste soil or in bushes, Esperanza, Escuintla, No. 2170.

Sida pyramidata Desp.—In thickets, Las Garzas, Acapetahua, No. 2697; in sandy field, near beach, Sta. Rosa, Tonalá, No. 17356.

Sida rhombifolia L.—In waste soil or in bushes, Acacoyagua, Escuintla, Nos. 96, 2144. Local name: "Escobillo."

Sida setifera Presl.—In sandy thickets, Mojarra, Tonalá, No. 17228.

Sphaeralcea rosea (DC.) Standl.—In thickets, at 2800 m. alt., near Col. Chiquihuite, south slope, Vol. Tacaná, No. 2835; in open field, at 3000 m. alt., Mt. Malé, No. 8637.

Urena sinuata L.—In grassy thickets, Turquía, Escuintla, No. 17087.

Wissedula excelsa (Cav.) Presl.—In open field, Cascada, Siltepec, No. 81.

BOMBACACEAE

Bernoullia flammea Oliver.—In dry forest, Huicisil, Mt. Madre Vieja, near Escuintla, No. 16409. Local name: "Palo de Corcho."

Bombax ellipticum HBK.—Mostly cultivated, for fence or garden, Acacoyagua, No. 17666; in Cruz de Chospo, Acacoyagua, No. 17834.

Ceiba acuminata (S. Wat.) Rose.—In dry or sandy woods, almost on all of Pacific Coast. Local name: "Ceiba."

Hampea macrocarpa Lundell, Lloydia 2: 102. 1939.—In woods, near beach, Las Garzas, Acapetahua (type locality), Nos. 2676, 2726.

Ochroma lagopus Swartz.—In dry woods, Huicisil, Mt. Madre Vieja, near Escuintla, Nos. 16412, 16400. Local name: "Arbol de Algodon."

Pachira aquatica Aubl.—In swampy bushy area, Acacoyagua, No. 2622; in wet lowlands, Esperanza, Escuintla, No. 17602. Local name: "Zapote de Agua."

Quararibea funebris (Llave) Vischer.—In wet forest, Esperanza, Escuintla, No. 16401. Local name: "Molinillo."

STERCULIACEAE

Ayenia pusilla L.—In grassy field, near beach, Paredon, Tonalá, No. 17022.

Byttneria aculeata Jacq.—In sunny thickets, Esperanza, Escuintla, No. 2139. Local name: "Zarza."

Byttneria catalpifolia Jacq.—In open woods, Cascada, Siltepec, No. 389; in woods, Mt. Madre Vieja, No. 2534; in woods, Cacaluta, Acacoyagua, Nos. 16866, 16991, 6028.

Chiranthodendron pantadactylon Larreategui.—In wet woods, Mt. Ovando, No. 2635; also collected at Frailesca, Siltepec, at about 1500 m. alt., in wet ravine. Local name: "Canaco."

Guazuma ulmifolia Lam.—Very common, in thickets, Escuintla, No. 922; in woods, at 700 m. alt., Chicomuselo, No. 5651. Local name: "Cuaulote."

Helicteres guazmaefolia HBK. (*Helicteres mexicana* HBK.).—In second growth, Escuintla, No. 2169.

Melochia Bernoulliana D. Sm.—In sandy thickets, Acacoyagua, Nos. 485, 2129; in thickets, Cacaluta, Escuintla, Nos. 17065, 18182.

Melochia hirsuta Cav.—In thickets, Col. Hidalgo, Acacoyagua, No. 16970; in savanna thickets, Chicomuselo, No. 4430; in grassy wet field, Sta. Elena, Acapetahua, No. 16684.

Melochia lupulina Sw.—In thickets, near Unión Juárez, Vol. Tacaná, No. 2788.

Melochia nodiflora Sw.—In thickets, near beach, Mojarra, Tonalá, No. 17158.

Melochia pyramidata L.—In sunny grassy thickets, Mojarra, Tonalá, No. 17238.

Sterculia apetala (Jacq.) Karst.—In woods, Esperanza, Escuintla, Nos. 6084, 17464. Local name: "Castaña." Fruit edible.

Sterculia mexicana R. Brs.—In forest, at 1000 m. alt., Mt. Ovando, Nos. 3920, 6171.

Theobroma angustifolium DC.—Cultivated, but often in wet forest, in almost Soconusco region. Local name: "Cacao."

Theobroma bicolor Humb. & Bonpl.—Cultivated, Esperanza, Escuintla, No. 16690; cultivated, Acacoyagua, Nos. 16733, 16840. Local name: "Pataste."

Theobroma Cacao L.—Cultivated, often in wet forest, from sea level to 500 m. alt. Local name: "Cacao."

Waltheria americana L.—In sunny thickets or bushes, Acacoyagua, Escuintla, No. 583; in field, Paredon, Tonalá, No. 16342; in woods, at 1300 m. alt., Mt. Ovando, No. 18259.

Waltheria brevipes Turcz.—In sandy thickets, Mojarra, Tonalá, No. 17199.

Waltheria glomerata Presl.—In second growth, Acacoyagua, Escuintla, No. 603.

DILLENIACEAE

Curatella americana L.—In savanna woods, Chicomuselo, No. 4455.

Davilla aspera (Aubl.) Ben.—In woods, Esperanza, Escuintla, Nos. 17305, 17532, 16834; in woods, Cacaluta, Acacoyagua, No. 16882. Local name: "Bejuco corralero."

Davilla rugosa Peir.—In sunny bushy area, Acacoyagua, Escuintla, No. 902.

Tetracera volubilis L.—In bushes, Acacoyagua, Escuintla, No. 604.

ACTINIDIACEAE

Saurauia leucocarpa Schlecht.—In forest, Mt. Ovando, No. 4171; in forest, Esperanza, Escuintla, Nos. 16536, 16827; in woods, Col. Hidalgo, Acacoyagua, No. 16605; in forest, Santa Isabel, Motozintla, No. 16417.

Saurauia Matudai Lundell, Contr. Univ. Mich. Herb. 7: 27. 1942.—In wet forest, at 2000 m. alt., Letrero, Siltepec (type locality), No. 4339.

Saurauia oreophila Hemsl.—In forest, at 2500 m. alt., Pinabeto, Motozintla, No. 15444.

Saurauia subalpina Donn. Smith.—In wet forest, Calera, Motozintla, No. 5515; in forest, Cacaluta, Escuintla, No. 16809.

OCHNACEAE

Ouretea guatemalensis Engler.—In wet edge of brook, Huicisil, Mt. Madre Vieja, near Escuintla, No. 16410; in wet forest, Córcega, Pueblo Nuevo Comaltitlán, No. 17660; in wet woods, Cintalapa, Escuintla, Nos. 17431, 17510.

Ouretea Peckii Riley.—In wet ravine, Piñuela, near Escuintla, No. 3355.

Ouretea pyramidalis Riley.—Riverside woods, at 700 m. alt., Piñuela, near Escuintla, Nos. 5010, 5009.

MARCGRAVIACEAE

Souroubea exauriculata Delp.—In forest, on tree, at 1900 m. alt., Mt. Ovando, Nos. 1853, 4146.

Souroubea triandra Lundell, Phytologia 1: 244. 1937.—On tree, in forest, Boqueron, Motozintla, Nos. 15354, 15411; in forest, Cacaluta, Escuintla, No. 16439; in forest, at 2000 m. alt., Mt. Ovando, No. 17754.

THEACEAE

Cleyera Matudai Kobuski, Journ. Arnold. Arb. 22: 403. 1941.—In wet advanced forest, at 1900 m. alt., Mt. Ovando (type locality), No. 2560.

Cleyera Skutchii Kobuski, Journ. Arnold. Arb. 22: 408. 1941.—In advanced forest, at 2000 m. alt., Mt. Pashtal, No. 1772; in mixed forest, at 2507 m. alt., Pinabeto, Motozintla, No. 5480. Known only from Guatemala, new to Mexican flora.

Cleyera tacanensis Kobuski, Journ. Arnold. Arb. 22: 406. 1941.—In forest, Rodeo, Siltepec, Nos. 4560, 5135; in forest, near Chiquihuite, south slope, Vol. Tacaná (type locality), No. 2845; in cloud forest, at 2300 m. alt., Tres Cruces, Sierra Madre, No. 5015.

Freziera macrophylla Tulasne.—In dense forest, Boqueron, No. 5388.

Symplococarpum flavifolium Lundell, Bull. Torrey Club 69: 393. 1942.—In mixed forest, Mt. Ovando (type locality), No. 696; in advanced forest, Las Cadenas, Sierra Madre, No. 1883.

Ternstroemia impressa Lundell, Bull. Torrey Club 66: 599. 1939.—In forest, at 2800 m. alt., near Chiquihuite, Vol. Tacaná (type locality), No. 2814; in forest, at 2600 m. alt., Pico de Loro, Sierra Madre, No. 4077.

Ternstroemia tepezapote Schlecht. & Cham.—In forest, Mt. Ovando, Nos. 641, 656, in forest, Cascada, Siltepec, No. 5150; in woods, Piñuela, at 700 m. alt., 30 km. north-east of Escuintla, No. 17565; in forest, Cacaluta, Acacoyagua, No. 17552.

GUTTIFERAE

Calophyllum braziliense Camp. var. *rokoi* Standl.—In wet forest, Esperanza, Escuintla, No. 1804. Local name: "Leche Amarillo."

Clusia guatemalensis Hemsl.—In riverside woods, Chicomuselo, No. 5640.

Clusia mexicana Vesque.—In forest, Mt. Ovando, No. 2079; in mixed forest, Vol. Tacaná, No. 2769; in wet forest, Barranca Honda, Siltepec, No. 4066.

Clusia Salvinii Donn. Sm.—In wet forest, at 1500-2200 m. alt., Mt. Ovando, Nos. 652, 1569, 2665, 4016, 4017, 17779; in woods, at 2016 m. alt., La Grandeza, No. 15577.

Hypericum apigeium Keller.—In thickets, Mt. Malé, No. 4664.

Hypericum Matudai Lundell, Bull. Torrey Club 69: 394. 1942.—In wet forest, Mt. Pashtal (type locality), No. 499.

Hypericum pratense Cham. & Schl.—In open woods, Cascada, Siltepec, N. 1732.

Hypericum Schaffneri Watson.—In open thickets, Nuevo Amatenango, No. 4727.

Hypericum Steyermarkii Standl.—In open thickets, at 2800 m. alt., Vol. Tacaná, No. 2894. Known from Guatemala, new to Mexican flora.

Hypericum uliginosum HBK.—In thickets, Siltepec, No. 2212.

Rheedia edulis (Seem.) Triana & Planch.—In dense forest, Mt. Ovando, Nos. 566, 16370, 16248; in wet forest, Mt. Pashtal, No. 2216. Local name: "Toronjil."

Rheedia intermedia Pittier.—In wet forest, at 1000 m. alt., Mt. Ovando, Nos. 17752, 17584.

Rheedia macrantha Standl. & Steyer.—In wet forest, at 1000 m. alt., Mt. Ovando, No. 17582.

BIXACEAE

Bixa orellana L.—Escuintla, No. 2165. Cultivated. Local name: "Achote."

COCHLOSPERMACEAE

Cochlospermum vitifolium (Willd.) Spreng.—In sandy sunny thickets, Esperanza, Escuintla, No. 2063. Local name: "Pumpusuchi."

VIOLACEAE

Corynostylis arborea (L.) Blake.—In thickets, near beach, Las Garzas, Acapetahua, No. 2727; in woods, Cerrito, Acapetahua, No. 16764; in woods, Col. Soconusco, Acapetahua, No. 17824.

Hybanthus attenuatus (Willd.) Schulze.—In sandy field, Acacoyagua, Escuintla, No. 912; in sandy field, Malpaso, Siltepec, No. 4515; in thickets, near beach, Mojarra, Tonala, No. 17170.

Hybanthus occultus (Polak.) Standl.—In open woods, Calera, Motozintla, No. 5514.

Rinorea guatemalensis (Wats.) Bartlett.—In wet forest, La Grada, Escuintla, Nos. 16602, 17558.

Viola Barroetana Schaffner.—In wet field, at 3000 m. alt., Mt. Malé, No. 4675.

Viola Nannei Polak.—In field, at 2100 m. alt., north slope, Vol. Tacaná, Nos. 2340, 2999.

Viola Nelsonii Becker.—In wet open grassy woods, Mt. Pashtal, No. 933.

Viola odorata L.—Cultivated, Esperanza, Escuintla, No. 17447.

Viola scandens Willd.—In field, at 2100 m. alt., north slope, Vol. Tacaná, No. 2391; in cloud forest, at 2300 m. alt., Tres Cruces, Sierra Madre, No. 5027.

FLACOURTIACEAE

Casearia aculeata Jacq.—In woods, Nandolopez, Acapetahua, No. 16657; in bushes, Mapastepec, No. 17524.

Casearia arguta HBK.—In woods, Esperanza, Escuintla, Nos. 267, 6077, 16530; in woods, Mt. Ovando, No. 6151; in woods, Cacaluta, Escuintla, No. 17059. Local name: "Pie de Venado."

Casearia dolichophylla Standl.—In woods, Chicomuselo, No. 4447; in woods, Nuevo Amatenango, No. 4791.

Casearia guianensis (Aubl.) Urban.—In woods, Mt. Madre Vieja, No. 667.

Casearia javitensis HBK.—In woods, Acacoyagua, Escuintla, Nos. 2603, 16363.

Casearia laevis Standl.—In woods, Las Garzas, Acapetahua, Nos. 2721, 2741.

Casearia mollifolia Standl.—In dry savanna woods, Chicomuselo, No. 5649.

Casearia nitida (L.) Jacq. In woods, at 1600 m. alt., Siltepec, No. 1662; in thickets, Escuintla, No. 950; in sandy thickets, Acacoyagua, Nos. 5335, 16517; in woods, Paredon, Tonalá, Nos. 16348, 16891.

Casearia obovata Schlecht.—In woods, Chicomuselo, Nos. 4437, 4496.

Casearia sylvestris Sw.—In woods, Escuintla, Nos. 1792, 16699.

Casearia tacanensis Lundell, Lloydia 4: 55. 1941.—In forest, at 200 m. alt., Vol. Tacaná (type locality), No. 2441; in open forest, Pico de Loro, Sierra Madre, No. 4245.

Hasseltia guatemalensis Warb.—In woods, Buena Vista, Escuintla, No. 1381; in forest, Siltepec, No. 385; in wet forest, at 1000 m. alt., Mt. Ovando, No. 16255. New to Mexican flora.

Lunania mexicana Brandeg.—In forest, Finca Juárez, Escuintla, No. 1674; in woods, Mazapa, No. 4861; in forest, La Grada, Escuintla, Nos. 16800, 16801.

Olmediella Betschleriana (Goepf.) Loes.—In woods, Pinada, Siltepec, No. 1988; also collected at La Grandeza. Local name: "Manzana de Juda."

Prokia crucis L.—In woods, Nuevo Amatenango, No. 4777; in forest, Mt. Madre Vieja, No. 2529; in forest, Malpaso, Siltepec, No. 4523; in sandy bushy area, Aguas Calientes, Escuintla, No. 16612.

Xylosma characanthum Standl.—In dry woods, at 1800 m. alt., Santa Rosa, Escuintla, No. 4228.

Xylosma ellipticum (clos) Hemsl.—In bushes, Escuintla, No. 1795.

Xylosma flexuosum (HBK.) Hemsl.—In sandy woods and bushes, Jilguero, Escuintla, No. 16442; in woods, at 800 m. alt., Nuevo Amatenango, No. 4800.

Xylosma horridum Rose.—In woods, Mt. Ovando, Escuintla, No. 522; in forest, Siltepec, No. 1682.

Xylosma sp.—In thickets, near base, Las Garza, Acapetahua, No. 2693.

TURNERACEAE

Erblichia xylocarpa var. *mollis* Standl. & Steyererm.—In forest, Santa Rita, Mapastepec, No. 2021; in woods, Unión Juárez, No. 2789; in advanced forest, at about 1000 m. alt., Mt. Ovando, No. 2653. Previously distributed as *E. odorata* Seem.

Turnera ulmifolia L.—In sandy sunny bushy area, Escuintla, Nos. 669, 16622; in thickets, Cerrito, Acapetahua, No. 1673.

PASSIFLORACEAE

Passiflora biflora Lam.—In second growth, Las Nuves, Escuintla, No. 16580; in thickets, near beach, Las Garzas, Acapetahua, No. 6038.

Passiflora coriacea Juss.—In sunny bushy area, Mapastepec, No. 1994; in thickets, Esperanza, Escuintla, No. 17497. Local name: "Ala de Chinaca."

Passiflora dolichocarpa Killip.—In forest, Haciendita, Siltepec, No. 1892. Known only from Guatemala, new to Mexican flora.

Passiflora edulis Sims.—Cultivated, at 1500-1800 m. alt., or more. Local name: "Granadilla."

- Passiflora filipes* Benth.—In second, sunny growth, Escuintla, Nos. 2132, 16445.
Passiflora foetida L.—In sandy sunny thickets, Mazapa, No. 4811.
Passiflora foetida var. *ciliata* (Dry.) Masters.—In dry field, near beach, Paredon, Tonalá, No. 18218.
Passiflora foetida var. *hastata* (Bertol) Masters.—Esperanza, Escuintla, No. 16716.
Passiflora foetida var. *hibiscifolia* (Lam.) Killip.—In thickets, Paredon, Tonalá, No. 16318.
Passiflora foetida var. *lanuginosa* Killip.—In sunny thickets, Acapetahua, No. 16402; in roadside thickets, Mapastepec, No. 17521.
Passiflora foetida var. *Maxonii* Killip.—In field, Acapetahua, No. 16359.
Passiflora jorullensis H.B.K.—In sunny thickets, Siltepec, No. 928.
Passiflora membranacea Benth.—In forest, Montecristo, No. 1984; in woods, Malpaso, Siltepec, No. 4700; in forest, Mt. Malé, No. 4700; in open forest, Vol. Tacaná, No. 2838; in woods, Tres Cruces, Sierra Madre, at 2600 m. alt., Nos. 5022, 17801.
Passiflora Nelsonii Mast. & Rose.—In second growth, at 1000 m. alt., Mt. Ovando, No. 6147.
Passiflora ornithoura Mast.—In second growth, at 2000 m. alt., Mt. Ovando, No. 3971. Known from Central America, new to Mexican flora.
Passiflora platyloba Killip.—In second growth, Libertad, Escuintla, No. 16568.
Passiflora prolata Masters.—In sandy sunny second growth, Las Nubes, Escuintla, No. 16479. Local name: "Granadilla de Monte."
Passiflora rugosissima Killip.—In thickets, Mt. Ovando, Escuintla, Nos. 477, 16231; in edge for forest, Finca Juárez, No. 1754. New for Chiapas flora.
Passiflora sexflora Juss.—In open edge of forest, at 2100 m. alt., north slope, Vol. Tacaná, No. 2997.

CARICACEAE

- Carica papaya* L.—Cultivated, from sea level to 1500 m. alt. Local name: "Papaya."
Carica pennata Heilborn.—In wet second growth, Esperanza, Escuintla, No. 16422. Local name: "Papaya de Monte," "Melocoton."

LOASACEAE

- Loasa triphylla* var. *rudis* (Benth.) Urb. & Grilg.—In brookside thickets, Vol. Tacaná, No. 2486; in wet ravine, Siltepec, No. 1576.
Gronovia scandens L.—In thickets, near beach, Paredon, Tonalá, No. 16907.
Mentzelia hispida Willd.—In sandy thickets, Escuintla, No. 160.
Sclerothrix fasciculata Presl.—In woods, at 1100 m. alt., Mt. Ovando.

BEGONIACEAE

- Begonia glabra* Aubl.—On wet rock, at 1400 m. alt., Unión Juárez, No. 2764.
Begonia herecleifolia Cham. & Schl.—On rock, near Cintalapa River, Escuintla, No. 17264.

CACTACEAE

- Acanthocereus pentagonus* (L.) Britt. & Rose.—In sandy sunny soil, Acacoyagua, No. 17665. Local name: "Chaco."
Chiapas Nelsonii Britt. & Rose.—In wet forest, at 1200 m. alt., Mt. Ovando, Nos. 2186, 16263.
Epiphyllum oxypetalum (DC.) Haw.—On tree, in forest, Esperanza, Escuintla, No. 16636. Local name: "Pitajaya."

Heliocereus Schrankii (Zucc.) Britt. & Rose.—In open woods, at 2800 m. alt., Vol. Tacaná, No. 2858.

Hylocereus undatus (Haw.) Britt. & Rose.—In advanced forest, Esperanza, Escuintla, Nos. 16474, 17771. Local name: "Pitajaya."

Lemaireocereus sp.—In sandy woods, Piñuela, northeast of Escuintla, at 700 m. alt., No. 17560.

Nopalea cochenillifera (L.) Salm.-Dyck.—In sandy soil, Esperanza, Escuintla, No. 17307.

Nopalea dejecta Salm.-Dyck.—In sandy thickets, Paredon, Tonalá, No. 16345.

Nopalea tulea Rose.—In sunny field, Ojo de Agua, at 1600 m. alt., at the foot of Mt. Pashtal, No. 17696.

Opuntia decumbens Salm.-Dyck.—In sandy sunny beach, Paredon, Tonalá, No. 16346.

Opuntia sp.—In dry field, at 1000 m. alt., Mazapa, No. 18217.

Pereskia aculeata Mill.—Cultivated, Esperanza, Escuintla, No. 17050. Local name: "Bugambilia Blanca."

Pereskia zinniaeflora DC.—Cultivated, Huixtla, No. 17608.

THYMELAEACEAE

Daphnopsis Bonplendiana (Kunth.) Standl.—In mixed woods, Saxchanal, at 2300 m. alt., Sierra Madre, No. 17803.

Daphnopsis fluvida Lundell, Phytologia 2: 3. 1941.—In forest, Mt. Ovando (type locality), No. 4157.

Daphnopsis Lindenii Meisn.—In mixed forest, Letrero, Siltepec, No. 4338; in wet forest, at 2000-2300 m. alt., Saxchanal, Sierra Madre, No. 4298.

LYTHRACEAE

Adenaria floribunda HBK.—In second growth bushes, Esperanza, Escuintla, Nos. 867 (fl.), 2591 (fr.); in sandy thickets, Jilguero, Escuintla, No. 16558.

Cuphea bustamanta Llave & Lex.—In sunny woods, at 1500 m. alt., Mt. Ovando, Nos. 2543, 895.

Cuphea carthagenensis (Jacq.) Macb.—In sunny field, Escuintla, No. 689; in wet field, Cerrito, Acapetahua, No. 16767.

Cuphea cristata Rose.—In thickets, at 1500-2000 m. alt., Mt. Ovando, Nos. 1809, 3959.

Cuphea infundibulum Kochne.—In pine woods, at 1700 m. alt., Mt. Ovando, No. 18304.

Cuphea nitidula HBK.—In sunny thickets, at 1500 m. alt., Mt. Ovando, No. 147.

Cuphea pinetorum Benth.—In open forest, Cascada, Siltepec, Nos. 1735, 5171; in open sunny woods, Mt. Ovando, No. 144.

Lafonesia puniceaefolia DC.—In sandy woods, Esperanza, Escuintla, No. 2147. Local name: "Campana."

Lausonia odorata L.—Cultivated, Acacoyagua, No. 17514.

Rotala ramosior (L.) Koehne.—In sandy field, Arista, Tonalá, No. 17317.

RHIZOPHORACEAE

Rhizophora Mangle L.—In Pampa, Las Garzas, Acapetahua, No. 2707; very common and abundant on Pacific Coast. Local name: "Mangle."

COMBRETACEAE

Combretum decandrum Jacq.—In bushes, Turquia, Escuintla, Nos. 414, 17038; in bushes, at 1900 m. alt., Mt. Pashtal, No. 1006.

Combretum erianthum Benth.—In woods, at 1900 m. alt., Mt. Ovando, No. 435; in woods, Jilguero, Escuintla, No. 17272; in bushes, Esperanza, Escuintla, No. 17451.

Combretum farinosum HBK.—In bushes, Paredon, Tonalá, No. 16326. Local name: "Chupamiel."

Combretum laxum Jacq.—In bushes, Acacoyagua, Nos. 16792, 17432. Local name: "Tamborillo."

Combretum laxiflorum H.B.K.—In sandy woods, Sta. Rosa, Tonalá, No. 17347.

Combretum mexicanum Humb. & Bonpl.—In secondary thickets, Escuintla, No. 420.

Conocarpus erecta L.—In woods, near beach, Las Garzas, Acapetahua, Nos. 2684, 16766; in woods, Paredon, Tonalá, No. 16294. Local name: "Botoncillo."

Terminalia catappa L.—Cultivated, Esperanza, Escuintla, No. 16534. Local name: "Almendro."

Terminalia excelsa Liebm.—In woods, Esperanza, Escuintla, No. 580. Local name: "Volador."

Terminalia lucida Hoffm.—In forest, Esperanza, Escuintla, Nos. 16447, 17461. Local name: "Volador."

MYRTACEAE

Calyptanthus chiapensis Lundell, Contr. Univ. Herb. Mich. 7: 28. 1942.—On river bank, Chicomuselo (type locality), No. 4488.

Calyptanthus perlaevigata Lundell, Contr. Univ. Herb. Mich. 7: 29. 1942.—On brook side, Honduras, Siltepec (type locality), No. 4387.

Eugenia axillaris (Sw.) Willd.—In open field, Col. Soconusco, Acapetahua, No. 16585; in woods, Acacoyagua, Nos. 16508, 16528. Local name: "Escobo fuerte"; in woods, Paredon, Tonalá, No. 16316. Local name: "Cinco Negrito."

Eugenia Capuli (Schl. & Cham.) Berg.—In woods, Siltepec, No. 279.

Eugenia capulioides Lundell, Contr. Univ. Herb. Mich. 7: 32. 1942.—In brook-side woods, Nuevo Amatenango, No. 4759; in wet woods, Malpaso, Siltepec (type locality), No. 4521.

Eugenia chiapensis Lundell, Amer. Midl. Nat. 20: 238. 1938.—In wet forest, Hacienda, Siltepec (type locality), No. 1904.

Eugenia citroides Lundell, Contr. Univ. Herb. Mich. 7: 35. 1942.—In wet woods, Ventana, Siltepec (type locality), No. 4554.

Eugenia escuintlensis Lundell, Phytologia 2: 4. 1941.—In woods, Esperanza, Escuintla (type locality), No. 4144.

Eugenia floribunda West. & Wild.—In wet forest, Mt. Madre Vieja, No. 2519. Known from West India, new to Mexican flora.

Eugenia fragrans Willd.—In wet forest, Pashtal, No. 468.

Eugenia jambo L.—Cultivated, Escuintla, No. 16830. Local name: "Pomarosa."

Eugenia malensis Lundell, in Sched.—In wet woods, at 3000 m. alt., Mt. Malé (type locality), No. 4668.

Eugenia Matudai Lundell, Phytologia 1: 218. 1937.—In forest, Mt. Madre Vieja, near Acacoyagua (type locality), No. 648.

Eugenia origanoides Berg.—In wet brookside woods, at 2000 m. alt., La Grandeza, Nos. 5548, 5555; in forest, at 1500 m. alt., San Luis, Siltepec, No. 5329.

Eugenia petenensis Lundell.—In mixed forest, at 1350 m. alt., Montecristo, No. 5936; in forest, Chicomuselo, No. 5647.

Eugenia siltepecana Lundell, Amer. Midl. Nat. 19: 430. 1938.—In wet woods, Silte-

pec (type locality), No. 1594; in woods, Finca Suiza, Montecristo, No. 1922; in wet woods, Nuevo Amatenango, No. 4750.

Myrtus Matudai Lundell, *Phytologia* 1: 247. 1937.—In wet forest, Mt. Pashtal (type locality), No. 459; in advanced forest, Saxchanal, No. 4288; in wet forest, Pico de Loro, No. 4076.

Psidium Friedrichsthalianum (Berg.) Ndzu.—In sandy bushy area, Arista, Tonalá, No. 17309.

Psidium guajava L.—In open field. Local name: "Guayaba."

Psidium Gentlei Lundell.—In savanna land, Concordia, at 543 m. alt., No. 15906-B.

Psidium guineense Swartz.—In thickets, near beach, Paredon, Tonalá, No. 18186.

Psidium molle Bertol.—In open field, Honduras, Siltepec, No. 4403. Local name: "Guayaba."

Psidium Oerstedianum Berg.—On brook side, Chicomuselo, No. 4475.

Psidium Sartorianum (Berg.) Ndzu.—In forest, Malpaso, Siltepec, No. 4524.

MELASTOMACEAE

Arthrostemma fragile Lindl.—On shaded brook side, Esperanza, Escuintla, Nos. 16079, 16627.

Blakea Purpusii Brandeg.—In woods, at 2000 m. alt., north slope, Vol. Tacaná, No. 2328; in advanced forest, Cerro Boqueron, No. 5353.

Centradenia chiapensis Brandeg.—On wet river side, Vol. Tacaná, No. 3000; on wet brook side, Unión Juárez, No. 2747.

Centradenia floribunda Planch.—In wet, sunny ravine, at 1400 m. alt., Unión Juárez, No. 2751.

Centradenia salicifolia Brandeg.—On wet brook side, at 2000 m. alt., north slope, Vol. Tacaná, Nos. 3001, 3002.

Clidemia dentata D. Don.—In wet forest, Mt. Ovando, No. 983; in forest, Esperanza, Escuintla, No. 16524.

Clidemia hirta (L.) D. Don.—In forest, Mt. Ovando, No. 879.

Clidemia setosa (Triana) Gleason.—In woods, Cacahuatan, No. 16418.

Conostegia sphaerica Triana.—In forest, at 1500 m. alt., Mt. Ovando, No. 16229.

Conostegia volcanalis Standl. & Steyerl.—In forest, Laguna, Salina, Montecristo, No. 2049; in wet woods, Mt. Ovando, No. 2644. Known from Guatemala, new to Mexican flora.

Canostegia xalapensis (Bonpl.) Don.—In open woods, Chicomuselo, No. 4440; in woods, Mt. Ovando, No. 829.

Heterocentron suffruticosum Brandeg.—In open bushes, Motozintla, No. 4852; in wet field, north slope, Vol. Tacaná, No. 2432.

Heterocentron muricata Gleason, Bull. Torrey Club 65: 575. 1938.—In wet woods (type locality), Montecristo, No. 1967.

Heterotrichum octonum (H. & B.) DC.—In woods, Mt. Madre Vieja, No. 984; in woods, Cacao, Acacoyagua, No. 16596; in woods, Montecristo, No. 5945.

Leandra melanodesma (Naud.) Cogn.—In woods, Siltepec, No. 997.

Leandra subseriata (Naud.) Cogn.—In mixed forest, Montecristo, No. 5051.

Miconia albicans (Sw.) Triana.—In savanna thickets, Chicomuselo, Nos. 4421, 5625.

Miconia aeruginosa Naud.—In forest, Mt. Ovando, No. 825.

Miconia argentea (Sw.) DC.—In woods, Esperanza, Escuintla, No. 991.

Miconia Bourgaeana Cogn.—In woods, Honduras, Siltepec, No. 4396; in woods, Unión Juárez, No. 2785.

Miconia Carioana Cogn.—In forest, Monte Cristo, No. 5996.

- Miconia cordata* DC.—In forest, Finca Suiza, Montecristo, No. 1934.
Miconia costaricensis Cogn.—In forest, Mt. Ovando, No. 823.
Miconia glaberrima (Schl.) Naud.—In woods, Mt. Ovando, Nos. 943, 934, 2093, 16254; at 2500 m. alt., in forest, Pinabeto, Motozintla, Nos. 5456, 5428; in wet woods, Niquivil, near Guatemalan border, No. 5493.
Miconia ibaguensis (Bonpl.) Triana.—In woods, Chicomuselo, No. 4471.
Miconia impetiolaris (Swartz.) D. Don.—In wet forest, Esperanza, Escuintla, Nos. 512, 16364, 17544; in wet forest, Corcega, Pueblo Nuevo Comaltitlan, No. 17661; in woods, at 1700 m. alt., Mt. Ovando, Nos. 17588, 952.
Miconia laevigata (L.) DC.—In forest, at 1700 m. alt., Montecristo, No. 15949.
Miconia lauriformis Naud.—In woods, Mt. Ovando, No. 2666.
Miconia longifolia (Aul.) DC.—In woods, Acapetahua, No. 2696.
Miconia mexicana (B. & B.) Naud.—In woods, Mt. Ovando, No. 822.
Miconia pinetorum Naud.—In forest, Saxchanal, Sierra Madre, No. 4292; Mt. Ovando, No. 821; in forest, at 2000 m. alt., north slope, Vol. Tacaná, No. 2330.
Miconia prasina (Sw.) DC.—In forest, Mt. Ovando, Nos. 880, 16253.
Miconia Schlechtendalii Cogn.—In forest, at 1300 m. alt., Monte Crista, No. 5937.
Monochaetum Deppanum (Schl. & Cham.) Naud.—In thickets, Mt. Ovando, No. 1065; in forest, Mt. Pashtal, No. 1066; in dry thickets, Vol. Tacaná, No. 2309.
Monochaetum pulchrum Dacaisne.—In woods, Mt. Ovando, No. 972.
Monochaetum rubescens Gl. Bull. Torrey Club 65: 578. 1938.—In woods, Mt. Ovando, No. 973; in forest, Siltepec (type locality), No. 932; in forest, Mt. Pashtal, No. 1015.
Mouriria parvifolia Benth.—In forest, Cacaluta, Acacoyagua, Nos. 16858, 16971. Local name: "Escobo."
Pterolepis pumila (Bonpl.) Cogn.—In thickets, Turquia, Escuintla, No. 17067.
Pterolepis trichotema (Rottb.) Cogn. In wet thickets, Escuintla, No. 987.
Tibouchina longifolia (Vahl.) Baill.—In forest, Mt. Ovando, Nos. 936, 970, 3928; in open forest, north slope, Vol. Tacaná, No. 2998; in riverside thickets, Barranca Honda, Siltepec, No. 4109.

ONAGRACEAE

- Epilobium mexicanum* DC.—In thickets, north slope, Vol. Tacaná, No. 2502.
Fuchsia aprica Lundell, Contr. Univ. Mich. Herb. 4: 18. 1940.—On volcanic rock, at 3000 m. alt., Vol. Tacaná (type locality), No. 2378.
Fuchsia arborecens Sim.—In forest, Mt. Ovando, Nos. 437, 16227; in woods, Mt. Malé, No. 4670; in forest, Vol. Tacaná, No. 2924; in woods, Siltepec, Nos. 815, 8121, 5219, 5090; in wet forest, Mt. Pashtal, No. 1695; in woods, at 2580 m. alt., Pinabeto, Motozintla, No. 15447.
Fuchsia heterotricha Lundell, Contr. Univ. Mich. Herb. 4: 19. 1940.—In open woods, at 1500 m. alt., north slope, Vol. Tacaná (type locality), No. 2457.
Fuchsia michoacanensis Sessé Mociño.—In mixed woods, at 1835 m. alt., Frailesca, Siltepec, No. 15252; in woods, at 1500 m. alt., Mt. Ovando, Nos. 17757, 18189.
Fuchsia microphylla H.B.K.—In wet woods, Mt. Malé, No. 4650.
Fuchsia minimiflora Hemsl.—In wet forest, Mt. Pashtal, No. 1686.
Fuchsia splendens Zucc.—In wet forest, at 3000 m. alt., Vol. Tacaná, No. 2322; in wet woods, at 2580 m. alt., Pinabeto, Motozintla, No. 5466; in cloud forest, Mt. Pashtal, No. 17688.
Fuchsia striolata Lundell, Contr. Univ. Mich. Herb. 4: 20. 1940.—In open woods, near Unión Juárez, Vol. Tacaná (type locality), No. 2765; in wet woods, at 1800 m. alt., Mt. Ovando, No. 4004.
Fuchsia tacanensis Lundell, Contr. Univ. Mich. Herb. 4: 20. 1940.—In open woods, near peak, Vol. Tacaná (type locality), No. 2399.

Fuchsia tetradactyla Lindl.—In wet pine woods, Mt. Malé, No. 4016; in wet thickets, Nuevo Amatenango, No. 4774.

Gaura coccinea Nutt.—In thickets, Escuintla, No. 676.

Gunnera Killipiana Lundell, *Phytologia* 1: 452. 1940.—In open ravine, or brookside, at 1400 m. alt., near Unión Juárez, Vol. Tacaná (type locality), No. 2763.

Hauiya Matudai Lundell, *Amer. Midl. Nat.* 19: 431. 1938.—In woods, Toquian, Siltepec (type locality), No. 1734.

Hauiya microcerata Donn.—In woods, Santa Rosa, Escuintla, No. 4238.

Jussiaea erecta L.—In swampy thickets, Escuintla, No. 673; in wet grassy field, near beach, Mojarra, Tonalá, No. 17201.

Jussiaea inclinata L. f.—In wet thickets, Escuintla, No. 2157.

Jussiaea natans H.B.K.—In water, near beach, Las Garzas, No. 2692.

Jussiaea nervosa var. *pubescens* Mich.—In wet field, Rancho Quemado, Acapetahua, No. 17396.

Jussiaea peruviana L.—In wet soil, San Vicente, Tapachula, No. 2512.

Jussiaea repens L.—In wet grassy field, Acacoyagua, No. 16621.

Jussiaea suffruticosa var. *ligustrifolia* (H.B.K.) Munz.—In wet grassy field, near beach, Mojarra, Tonalá, Nos. 17202, 16946.

Lopezia grandiflora Zucc.—On brook side, Barranca Honda, Siltepec, No. 4118.

Lopezia hirsuta Jacq.—In thickets, at 2000 m. alt., Vol. Tacaná, No. 2383; in open thickets, at 1900 m. alt., Mt. Ovando, Nos. 17747, 2540.

Lopezia integrifolia DC.—In wet thickets, Mt. Ovando, Nos. 697, 16232.

Lopezia macrophylla Benth.—In thickets, at 1500 m. alt., Vol. Tacaná, No. 2407.

Lopezia mexicana Jacq.—In open woods, at 2000 m. alt., Frailesca, Siltepec, No. 5212; in thickets, San Luis, Siltepec, No. 5307.

Oenothera cuprea Schlecht.—In pine woods, at 2300 m. alt., Vol. Tacaná, No. 2592.

Oenothera multicaulis var. *tarquensis* (H.B.K.) Munz. & Jtn.—In pine land, Mt. Malé, No. 4594; in wet edge of forest, Finca Juárez, No. 1775.

Oenothera rosea A.T.—In thickets, at 1500 m. alt., Vol. Tacaná, No. 2448; in woods, Cacaluta, Escuintla, No. 1700.

Oenothera tetraptera Cav.—In wet thickets, Finca Juárez, Escuintla, No. 1773.

ARALIACEAE

Aralia humilis Cav.—In grassy thickets, Siltepec, No. 1579.

Dendropanax arboreum (L.) Dcne. & Planch.—In woods, at 800 m. alt., Piñuela, Escuintla, No. 17563; in wet forest, Esperanza, Escuintla, No. 17480; in woods, at 1600 m. alt., Cascada, Siltepec, No. 5066.

Gilbertia arborea (L.) March.—In forest, Laguna, Salina, Siltepec, No. 1936; in woods, Escuintla, No. 1070; in forest, at 2100 m. alt., north slope, Vol. Tacaná, No. 2940.

Nothopanax ornatum (Bull.) Merr.—Cultivated, Mapastepec, No. 17520.

Oreopanax capitatum (Jacq.) Dcne. & Pl.—In forest, Saxchanal, Sierra Madre, No. 4322; in woods, Mazapa, No. 4865; in forest, at 2000 m. alt., Mt. Ovando, Nos. 1570, 2329; in forest, Vol. Tacaná, Nos. 2325, 2410.

Oreopanax flaccidum Marchal.—In forest, Siltepec, No. 1678.

Oreopanax Liebmanni March.—In wet forest, Niquivil, near Guatemalan border, No. 5501; in forest, at 2800 m. alt., north slope, Vol. Tacaná, No. 2922; in cloud forest, at 2300 m. alt., Mt. Pashtal, Nos. 16089, 1075.

Oreopanax peltatum Linden.—In forest, Siltepec, No. 1593; in wet forest, Mt. Ovando, Nos. 417, 4153, 17579.

Oreopanax Sanderianum Hemsl.—In wet forest, Mt. Ovando, Nos. 6050, 406.

Oreopanax xalapense Pl. & Dec.—In forest, Mt. Ovando, No. 480; in forest, Cascada, Siltepec, No. 1637; in forest, Saxchanal, Sierra Madre, No. 4286; in mixed forest, Caleras, Motozintla, No. 5512.

UMBELLIFERAE

Arracacia atropurpurea (Lebm.) B. & H.—In pine woods, Mt. Malé, No. 4690; in grassy, wet field, Ventana, Siltepec, No. 4540.

Arracacia bracteata C. & R.—In thickets, Cascada, Siltepec, No. 1062; in wet field, Mt. Malé, No. 4609; in wet field, Pinabeto, Motozintla, No. 15432.

Arracacia guatemalensis C. & R.—On sunny ridge, at 3000 m. alt., north slope, Vol. Tacaná, No. 2336.

Daucus montanus Willd.—In open woods, at 1500 m. alt., Mt. Ovando, No. 18296.

Daweya filiformis (C. et. R.) Mathias & Constance.—In stony thickets, at 4000 m. alt., Vol. Tacaná, No. 2356.

Donnellsmithia peucedanoides (H.B.K.) Mathias & Constance.—In wet field, Nuevo Amatenango, No. 4713.

Eryngium Carlinae Deler.—In grassy field, at 4000 m. alt., Vol. Tacaná, No. 2345.

Eryngium foetidum L.—In wet field, Rodeo, Siltepec, No. 4563.

Eryngium guatemalensis Hemsl.—In open grassy pine woods, at 3900 m. alt., Vol. Tacaná, No. 2323.

Eryngium Ghiesbreghtii Delar.—In grassy field, Nuevo Amatenango, No. 4733; in wet field, Cascada, Siltepec, No. 1615.

Hydrocotyle mexicana Cham. & Schlecht.—In wet shaded soil, Mt. Ovando, Nos. 439, 17749; in wet ground in forest, Letrero, Siltepec, Nos. 4342, 5316.

Hydrocotyle umbellata L.—On river bank, Mazapa, No. 4829.

Micropleura renifolia Lag.—In wet field, Siltepec, No. 1611; in field, Nuevo Amatenango, No. 4765; on wet brook side, Mazapa, No. 5961.

Neonelsonia ovata C. & R.—In sunny thickets, west slope, Vol. Tacaná, No. 2905.

Sanicula mexicana DC.—In woods, Nuevo Amatenango, No. 4769; in open woods, Barranca Honda, Siltepec, No. 4083; in wet woods, Vol. Tacaná, No. 2487.

Spananthe paniculata Jacq.—In wet field, Nuevo Amatenango, No. 4739; in thickets, Escuintla, No. 946.

CORNACEAE

Cornus disciflora DC.—In forest, Rodeo, Siltepec, No. 4571; in mixed forest, Montecristo, No. 1979; in forest, Saxchanal, No. 4308; in wet forest, Vol. Tacaná, No. 2402. Local name: "Isimac" (by Tacanec Indians).

CLETHRACEAE

Clethra glaberrima Lundell, Phytologia 1: 219. 1937.—In mixed forest, at 1900-2200 m. alt., Mt. Ovando (type locality), No. 520; in open forest, Barranca Honda, Siltepec, Nos. 1699, 4102; in sunny forest, Saxchanal, No. 4302.

Clethra Matudai Lundell, Phytologia 1: 220. 1937.—In advanced forest, Mt. Pashtal, Sierra Madre (type locality), No. 398; in sunny forest, at 1900 m. alt., Mt. Ovando, No. 16259.

Clethra obliquinervia Standl. Field Mus. Bot. 22: 95. 1940.—In woods, at 1700 m. alt., Buena Vista, Escuintla (type locality), No. 1894.

Clethra parvifolia Lundell, Phytologia 1: 220. 1937.—In forest, Mt. Ovando (type locality), No. 452.

Clethra quercifolia Lindl.—In woods, Mt. Ovando, No. 426.

Clethra salvadorensis Britton.—In woods, at 700 m. alt., Piñuela, 32 km. northeast of Escuintla, No. 17570.

Clethra tacanensis Lundell, in Sched.—In woods, at 1400 m. alt., Unión Juárez, No. 2753; in forest, at 2800 m. alt., near Chiquihuite, Vol. Tacaná (type locality), No. 2820.

PYROLACEAE

Chimaphyla maculata (L.) Pursk.—In wet forest, Salina, Montecristo, No. 1917.

Monotropa coccinea Zucc.—In forest, Haciendita, Siltepec, No. 1989; in open forest, Mt. Pashtal, No. 1689; in wet open forest, Mt. Ovando, Nos. 6040, 421; in shaded forest, at 2000 m. alt., Pico de Loro, Sierra Madre, No. 4276.

Pyrola elatior (Lange) Lundell.—In wet forest, north slope, Vol. Tacaná, No. 2315.

ERICACEAE

Arbutus glandulosus Mart. & Gal.—In advanced forest, Mt. Pashtal, No. 399.

Arbutus xalapensis H.B.K.—In woods, Montecristo, No. 1987; in wet forest, at 2540 m. alt., Pinabeto, Motozintla, No. 15443.

Arctostaphylos chiapensis Lundell, in Sched.—In wet woods, Mt. Malé (type locality), No. 4634.

Befaria guatemalensis Camp.—In forest, at 1500-2000 m. alt., Mt. Ovando, No. 17737.

Befaria laevis Benth.—In wet forest, Mt. Ovando, Nos. 430, 859, 1837, 2589, 16261.

Cavendishia chiapensis Brandeg.—In forest, Calera, Motozintla, No. 5527; in wet forest, at 1800 m. alt., Mt. Ovando, No. 17735; in cloud forest, at 2700 m. alt., Mt. Pashtal, No. 17669; in cloud forest, at 1700 m. alt., Saxchanal, Sierra Madre, No. 17800; in cloud forest, at 2600 m. alt., Tres Cruces, Sierra Madre, No. 5032.

Cavendishia crassifolia (Benth.) Hemsl.—In forest, Mt. Ovando, Nos. 858, 4227; in woods, Mt. Malé, No. 4625.

Gaultheria acuminata Schlecht. & Cham.—In wet forest, Mt. Pashtal, No. 462.

Gaultheria chiapensis Camp, Bull. Torrey Club 66: 12. 1939.—In forest, Mt. Ovando, No. 4156; in wet forest, Cerro de Mapastepec (type locality), No. 2041; in wet forest, Mt. Pashtal, No. 1009; in sunny woods, at 2015 m. alt., La Grandeza, No. 5554; in cloud forest, at 2300 m. alt., Frailesca, Siltepec, No. 15260; in cloud forest, at 2300 m. alt., Tres Cruces, Sierra Madre, No. 5039.

Gaultheria Hartwegiana Klotsch.—On stony ridge, at 2540 m. alt., Boqueron, Motozintla, No. 5345.

Gaultheria hirtiflora Benth.—In sunny woods, Saxchanal, Sierra Madre, No. 4294; in dry forest, Barranca Honda, Siltepec, No. 4078; in sunny woods, Haciendita, Siltepec, No. 1970.

Gaultheria Nelsonii Small.—In sunny woods, at 2786 m. alt., Niquivil, Motozintla, near Guatemalan border, No. 5497.

Gaultheria tacanensis Camp.—In cloud forest, at 2400 m. alt., Tres Cruces, Sierra Madre, No. 5018.

Malea pilosa Lundell, Amer. Midl. Nat. 29: 484. 1943.—Parasite on trees, in woods, Mt. Malé (type locality), No. 4614; in wet woods, Rodeo, Siltepec, No. 4580; also collected at Niquivil.

Pernettya ciliata Schl. & Cham.—In cloud forest, at 3500 m. alt., north slope, Vol. Tacaná, No. 2319.

Pernettya Tomasii Camp, Bull. Torrey Club 66: 25. 1939.—Among volcanic rocks, at 4000 m. altitude, Vol. Tacaná (type locality), No. 2319.

Satyria Warszewiczii Klotzsch.—In wet forest, Boqueron, No. 15404.

Vaccinium confertum HBK.—In cloud forest, at 2300 m. alt., Tres Cruces, Sierra Madre, No. 5119; in cloud woods, at 3500 m. alt., north slope, Vol. Tacaná, No. 2363.

Vaccinium cordatum Hemsl.—In cloud forest, at 2700 m. alt., Mt. Pashtal, No. 17691.

Vaccinium leucanthum Cham. & Schlecht.—In open woods, at 2100 m. alt., La Granda, No. 5560; in mixed forest, at 2000 m. alt., Saxchanal, Sierra Madre, No. 17799.

Vaccinium Matudai Lundell, Phytologia 2: 4. 1941.—Among sunny rocks, at 2800 m. altitude, Pico de Loro (type locality), No. 4074.

Xolisma squamulosa (Mart. & Gal.) Small.—In pine woods, Barranca Honda, Siltepec, No. 4134.

THEOPHRASTACEAE

Deherainia Matudai Lundell, Amer. Midl. Nat. 20: 239. 1938.—In forest, Santa Rita, Mapastepec (type locality), No. 2022. Known only from the type locality.

Jacquinia aurantiaca Ait.—In sandy sunny woods, near beach, Las Garzas, Acapetahua, No. 3377; in sandy field, Belem, Mapastepec, No. 16736; on sandy sunny beach, Sta. Rosa, Tonalá, Nos. 17349, 17313, 17958. Local name: "Sacramento."

Jacquinia pungens A. Gray.—On sandy sunny beach, Paredon, Tonalá, Nos. 16285, 16298, 16336.

MYRSINACEAE

Ardisia compressa H.B.K.—In forest, Barranca Honda, Siltepec, No. 4053; in forest, Mt. Ovando, Nos. 445, 3931, 18250, 6159; in wet woods, Siltepec, Nos. 454, 5161; in woods, Nandolopez, Acapetahua, No. 16656; in forest, at 2580 m. alt., Pinabeto, Motozintla, No. 15462.

Ardisia ovandensis Lundell, Contr. Univ. Mich. Herb. 4: 21. 1940.—In forest, Mt. Ovando (type locality), Nos. 2549, 16228; in wet forest, Pico de Loro, Sierra Madre, No. 4281.

Ardisia paschalis Donn. Smith.—In wet woods, Jilguero, Escuintla, No. 16504; in forest, Huicisil, Acacoyagua, No. 16724.

Ardisia rarescens Standl.—In forest, Mt. Ovando, Nos. 680, 3942; in mixed forest, Saxchanal, No. 4306; in wet forest, Mt. Pashtal, No. 1641. Second collection in Mexico, the type is reported Cerro Boqueron.

Ardisia tacanensis Lundell, Contr. Univ. Mich. Herb. 4: 21. 1940.—In forest, north slope, at about 2500 m. alt., Vol. Tacaná (type locality), No. s-226.

Ardisia venosa Mast.—In mixed forest, Mt. Ovando, No. 659; in woods, Mt. Malé, No. 4699.

Ardisia venosa var. *macrantha* Lundell.—In mixed forest, south slope near Chiquihuite, Vol. Tacaná (type locality), No. 2815.

Ardisia verapazensis Donn.—In wet forest, Vol. Tacaná, No. 2392. New to Mexican flora.

Parathesis calophylla Donn. Sm.—In woods, Saxchanal, No. 4293; in wet woods, Rodeo, Siltepec, No. 4555. Reported from Guatemala, New to Mexican flora.

Parathesis chiapensis Fernald.—In wet woods, Honduras, Siltepec, No. 4416. Reported from Ocoingo, north region of the State of Chiapas, extending the distribution as far south as one branch of the Sierra Madre of the Pacific Coast.

Parathesis Donnell-Smithii Mez ex. Char.—In wet woods, Nuevo Amatenango, No. 4720. Another species new to Mexican flora.

Parathesis leptosa Lundell, Contr. Univ. Mich. Herb. 7: 41. 1942.—In wet forest, Saxchanal, Sierra Madre (type locality), No. 4297.

Parathesis melanostiacta (Schlecht.) Hemsl.—In wet forest, Haciendita, Escuintla, No. 5985; in wet forest, Libertad Calera, Motozintla, No. 5520; in cloud forest, at 2300 m. alt., Tres Cruces, No. 5036; in cloud forest, at 2000 m. alt., Saxchanal, Sierra Madre, Nos. 17810, 17806.

Parathesis serrulata (Sw.) Mez.—In wet forest, Mt. Ovando, Nos. 1851, 16468; in forest, Santa Isabel, Motozintla, No. 16406; in woods, Esperanza, Escuintla, No. 16704.

Ropanea ferruginea (R. P.) Mez.—In mixed forest, Mt. Ovando, No. 677; in advanced forest, Haciendita, Siltepec, Nos. 2004, 5128; in advanced forest, Mt. Pashtal,

Sierra Madre, No. 2213; in mixed forest, at 1600 m. alt., Cascada, Siltepec, No. 5130.

Rapanea Jurgensenii Mez.—In wet forest, at 1600 m. alt., Cascada, Siltepec, No. 5116.

Rapanea pellucido-punctata (Oerst.) Mez.—In wet forest, Pico de Loro, No. 4282.

SAPOTACEAE

Achras zapota L.—In open dry woods, near Finca Magnolia, Escuintla, No. 16671; also cultivated. Local name: "Chico Zapote."

Bumelia celastrina H.B.K.—In sandy woods, near beach, Sta. Rosa, Tonalá, No. 17355.

Bumelia laetivirens Hemsl.—In woods, near beach, Paredon, Tonalá, No. 16297.

Bumelia persimilis Hemsl.—In woods, near beach, Paredon, Tonalá, No. 16347.

Bumelia spiniflora A. DC.—In woods, near beach, Las Garzas, Acapetahua, No. 2702.

Calocarpum zapota (Jacq.) Merrill.—In forest, Esperanza, Escuintla, No. 16643. Local name: "Zapote."

Chrysophyllum caimito L.—Cultivated, Escuintla, No. 16831. Local name: "Caimito."

Chrysophyllum mexicanum Brandeg.—In open woods, Acacoyagua, No. 16696. Local name: "Caimito Simarrón."

Chrysophyllum mexicanum var. *typicum* Cronquist.—In woods, Nuevo Amatenango, No. 4768; in sandy woods, Escuintla, No. 2621. Local name: "Caimito Simarrón." Distributed previously as *C. oliviforme* L.

Dipholis Matudai (Lundell) Lundell, *Phytologia* 1: 221. 1937, Contr. Univ. Mich. Herb. 7: 43. 1942.—In virgin forest, at 1000 m. alt., Mt. Ovando (type locality), No. 4175.

Micropholis mexicana Gilly, -Syn. *Sideroxylon calophylloides* Lundell, Contr. Univ. Mich. Herb. 6: 56. 1941.—In virgin forest, Mt. Ovando (type locality), No. 4195; in forest, Cacaluta, Escuintla, Nos. 16597, 17559. Local name: "Baricoco," fruit edible.

Pouteria campechiana (HBK.) Baehni.—In forest, at upper course of Cacaluta River, Escuintla, Nos. 16810, 17551; in forest, Jilguerro, Escuintla, No. 16382; in forest, Esperanza, Escuintla, No. 17378.

Sideroxylon Capiri (A. DC.) Pittier.—In wet forest, Cacaluta, Acacoyagua, Nos. 16484, 16520. Local name: "Tempishque."

EBENACEAE

Diospyros Ebenaster Retz.—In wet forest, Col. Soconusco, Acapetahua, Nos. 16679, 17406. Local name: "Zapote Negro." Edible.

Diospyros pergamentacea Lundell, Contr. Univ. Mich. Herb. 7: 44. 1942.—In virgin forest, about near Ojo de Agua, Pico de Loro (type locality), No. 4278.

Diospyros verae-crucis Standl.—On sunny sandy river bank bushes, Escuintla, Nos. 16577, 16616, 16515, 16396; in woods, at 2000 m. alt., Frailesca, Siltepec, No. 5228.

Diospyros yatesiana Standl.—In woods, Paredon, Tonalá, No. 16283. Doubtful species.

SYMPLOCACEAE

Symplocos chiapensis Lundell, Amer. Midl. Nat. 20: 240. 1938.—In wet forest, at 1000-1500 m. alt., Mt. Ovando, No. 2208.

Symplocos flavifolia Lundell, Amer. Midl. Nat. 20: 240. 1938.—In forest, Montecristo (type locality), No. 1980; in woods, Santa Rosa, Escuintla, No. 4252.

Symplocos Limoncillo Humb. & Bonpl.—In wet forest, Pinabeto, No. 15483; in mixed forest, Boqueron, No. 15363.

Symplocos Matudai Lundell, Amer. Midl. Nat. 20: 241. 1938.—In wet forest, at about 2500 m. alt., Mt. Malé (type locality), No. 4674.

Symplocos tacanensis Lundell, Bull. Torrey Club 66: 601. 1939.—In wet ravine, near Aguas Calientes, north slope, Vol. Tacaná (type locality), No. 2976.

STYRACACEAE

Styrax argenteus Presl.—In woods, Frailesca, at 1800 m. alt., Siltepec, No. 5215.

Styrax conterminus Donn. Smith.—In woods, Niquivil, near Guatemalan border, No. 5507.

Styrax glabrescens Benth.—In advanced forest, Letrero, Siltepec, No. 4335; in woods, Haciendita, Escuintla, No. 5995; in woods, Boqueron, No. 5410; in forest, at 1600 m. alt., Cascada, Siltepec, No. 5102; in woods, at 2300 m. alt., Saxchanal, Sierra Madre, No. 17816.

Styrax magnus Lundell, Bull. Torrey Club 66: 600. 1939.—In woods, at 2100 m. alt., slope, Vol. Tacaná (type locality), No. 2982.

Styrax pilosus (Perkins) Standl.—In woods, at 1500 m. alt., Mt. Ovando, No. 4179.

Styrax polyneurus Perk.—In forest, Mt. Ovando, Nos. 568, 2668, 3930, 16265; in mixed forest, Barranca Honda, Siltepec, No. 4135; in forest, Mt. Pashtal, No. 4617.

OLEACEAE

Jasminum multiflorum (Burm.) Andr.—Cultivated, Acacoyagua, No. 17511. Local name: "Guimalda."

Jasminum pubescens (Reiz.) Willd.—Escuintla, No. 1031. Cultivated only.

Fraxinus chiapensis Lundell, Contr. Univ. Mich. Herb. 7: 45. 1942.—In wet ravine, Nuevo Amatenango (type locality), No. 4762.

Ligustrum lucidum Ait.—In woods, La Grandeza, No. 5572.

Osmanthus mexicanus Lundell, Phytologia 1: 308. 1939.—In advanced wet forest, Cerro Laguna, Mapastepec (type locality), No. 2023; in cloud forest, at 2300 m. alt., Tres Cruces, Sierra Madre, No. 5120.

LOGANIACEAE

Buddleia americana L.—In sunny second growth, Mt. Ovando, Nos. 964, 16230; in woods, at 1300 m. alt., San Luis, Siltepec, No. 15304.

Buddleia floccosa Kunth.—In open thickets, north slope, Mt. Ovando, No. 2258.

Buddleia macrocephala D. Sm.—In stony thickets, at 3000 m. alt., Vol. Tacaná, No. 2338.

Buddleia nitida Benth.—On sunny volcanic stone, near peak, Vol. Tacaná, Nos. 2873, 2418, 2886.

Buddleia ovandensis Lundell, in Sched.—In wet ravine at 1900 m. alt., Mt. Ovando (type locality), No. 2664.

Buddleia Skutchii Morton, Contr. Univ. Mich. Herb. 6: 57. 1941.—In open thickets, at 1500 m. alt., Mt. Ovando, No. S-185. Previously distributed as "*Buddleia Matudae* Standl."

Spigelia anthelmia L.—In grassy wet field, Sta. Elena, Acapetahua, No. 16686.

Spigelia Humboldtiana C. & S.—In woods, Escuintla, Nos. 2113, 16989; in second growth, at 1000 m. alt., Vol. Tacaná, No. 2499.

Strychnos panamensis Seem.—In wet bushy area, mostly river bank, Cruz de Piedra, Acacoyagua, Nos. 16501, 16868, 17626. Local name: "Patate de Caballo."

GENTIANACEAE

Chelonanthus alatus (Aubl.) Pulle.—In wet thickets, near Unión Juárez, south slope of Vol. Tacaná, No. 18308.

Erythraea quitensis H.B.K.—In pine woods, Barranca Honda, Siltepec, No. 4104.

Eustoma exaltatum (L.) Salisb.—In open woods, Mt. Ovando, No. 18309.

Gentiana pumilio Standl. & Steyererm.—On stony peak, Vol. Tacaná, No. 2868. New to Mexican flora. Previously distributed as *G. sedifolia* HBK.

Halenia brevicornis var. *latifolia* (C. & S.) Allen.—In woods, Siltepec, No. 2596; in sunny pine woods, Vol. Tacaná, No. 2473.

Halenia Shannoi Briq.—In sunny pine woods, at 4000 m. alt., Vol. Tacaná, No. 2346; in pine woods, Mt. Malé, No. 4706. Local name: "Violeta."

Limnanthemum Humboldtianum (H.B.K.) Griseb.—In swampy sunny thickets, near beach, Las Garzas, Acapetahua, No. 2688; in swamps, Paredon, Tonalá, No. 16293.

Schltesia lisianthoides (Griseb.) B. & H.—In pine woods, at 1500 m. alt., Mt. Ovando, No. 16243; in sandy field, Arista, Tonalá, No. 17333.

APOCYNACEAE

Aspidosperma chiapensis Matuda.—In forest, Esperanza, Escuintla (type locality), Nos. 2030, 17634, 16361, 17839. Distributed as *A. cruentum* Woods. Local name: "Chiche."

Haplophyton cimicidum A. DC.—In thickets, Mazapa de Madero, No. 4819.

Lochnera rosea (L.) Reichenb.—Cultivated, Escuintla, No. 16428. Local name: "Chula."

Mandevilla mollis Lundell, Contr. Univ. Mich. Herb. 7: 46. 1942.—In woods, at 1600 m. alt., Santa Rosa, Escuintla (type locality) No. 4240.

Mandevilla subsagittata (R. & P.) Woods.—In thickets, Chicomuselo, No. 4433; in thickets, Nuevo Amatenango, No. 4784; in secondary thickets, Cascada, Siltepec, No. 1730.

Mandevilla villosa (Miers.) Woods.—In second growth, Castaño, Escuintla, No. 1791.

Mesechites trifida (Jacq.) Muell. Arg.—In sandy bushy area, near beach, Arista, Tonalá, No. 17370.

Plumeria rubra L.—Cultivated, Escuintla, Nos. 16557, 17516. Local name: "Sangre de Toro."

Plumeria rubra f. *acutifolia* (Poir.) Woodson.—In riverside woods, Cacaluta, Escuintla, No. 16638. Local name: "Flor Blanca."

Plumeriopsis Ahouai (L.) Rusby & Woodson.—In wet woods, Soconusco, Acapetahua, No. 16544. Local name: "Chilindron de Monte."

Prestonia guatemalensis Woods.—In second growth, Escuintla, Nos. 2159, 16460.

Prestonia mexicana A. DC.—In thickets, Escuintla, Nos. 581, 2623; in thickets, Miramar, Escuintla, No. 1621; in thickets, Las Garzas, Acapetahua, No. 2812.

Prestonia speciosa Donn. Sm.—In woods, Siltepec, No. 4681.

Rauwolfia hirsuta Jacq. var. *glabra* (M. Arg.) Woodson.—In sunny thickets, Acapetahua, Nos. 16423, 16506; in thickets, Paredon, Tonalá, No. 16896. Local name: "Coralillo."

Rauwolfia indecora Woods.—In thickets, near beach, Las Garzas, Acapetahua, Nos. 2687, 2734; in thickets, Paredon, Tonalá, Nos. 16293, 16927.

Stemmadenia decipiens Woodson.—In woods, at 2000 m. alt., La Grandeza, No. 5553.

Stemmadenia Donnell-Smithii Woods.—In woods, Esperanza, Escuintla, No. 415. Local name: "Chapona."

Stemmadenia Galeottiana (A. Rich.) Mirs.—In forest, Mt. Ovando, No. 2096; in woods, Paredon, Tonalá, No. 16895.

Stemmadenia mollis Benth.—In woods, Paredon, Tonalá, No. 16322. Local name: "Cajon de balaco."

Stemmadenia obovata (H. & A.) Schum.—In sandy bushy area, Mojarra, Tonalá, No. 17149; in field, Chicomuselo, No. 15645; in field, Nuevo Amatenango, No. 4786.

Tabernaemontana amygdalisolia Jacq.—In forest, Mt. Pashtal, Sierra Madre, No. 1868; in woods, Acapetahua, No. 2735; in woods, Huixtla, No. 17609.

Tabernaemontana arborea Rose.—In woods, near beach, Cerrito, Acapetahua, No. 17716.

Thevetia ovata (Cav.) A. DC.—In second, sunny growth, Mt. Malé, No. 4659; in woods, Mt. Ovando, No. 6129.

Thevetia peruviana (Pers.) Schum.—Cultivated, Esperanza, Escuintla, No. 16715. Local name: "Chilindron."

Tonduzia longifolia (A. DC.) Woods.—In woods, Mt. Ovando, No. 4201; in bushes, Escuintla, No. 639; in open forest, at 1600 m. alt., Santa Rosa, near Escuintla, No. 4231.

Vallesia mexicana Muell. Arg.—In forest, Siltepec, No. 4351; in woods, Saxchanal, Sierra Madre, Nos. 4316, 17811; in wet forest, Vol. Tacaná, No. 2977; in woods, Siltepec, No. 5613.

ASCLEPIADACEAE

Asclepias curassavica L.—In grassy sunny thickets, Nuevo Amatenango, No. 4738; along railway, Pueblo Nuevo Comaltilán, No. 17655; in second growth, at 1700 m. alt., Pico de Loro, No. 4266.

Asclepias alata Benth.—In open thickets, Mazapa, No. 1331.

Asclepias glaucescens HBK.—In field, at 2000 m. alt., La Grandeza, No. 15552; in savanna grassy field, at 700 m. alt., Chicomuselo, No. 15630.

Asclepias longicornu Benth.—In field, Paredon, Tonalá, No. 16337; in roadside sunny thickets, Mapastepec, No. 17519.

Asclepias similis Hemsl.—In field, Col. Soconusco, Acapetahua, No. 2201; in field, Cascada, Siltepec, No. 1769.

Blepharodon mucronatum (Schl.) Dcne.—In woods, Nuevo Amatenango, No. 4721; in bushes, Escuintla, Nos. 1856, 6029, 16816, 16911. Local name: "Contuhua Simarron."

Fischeria oaxacana Standl.—In sunny, sandy thickets, Escuintla, No. 644.

Funastrum clausum (Jacq.) Schl.—In sandy, sunny thickets, Escuintla, No. 699.

Gonolobus barbatus H.B.K.—In thickets, Chicomuselo, No. 4456; in thickets, near beach, Mapastepec, No. 16742.

Gonolobus chiapensis (Brandeg.) Woods.—In thickets, Estacado, Mapastepec, No. 2043.

Gonolobus niger (Cav.) R. Br.—In thickets, Cascada, Siltepec, No. 1629.

Gonolobus stenocephalus (Donn. Sm.) Woods.—In thickets, Siltepec, N. 1680.

Marsdenia macrophylla (Humb. & Bonpl.) Fourn.—In thickets, Escuintla, Nos. 498, 5001; in sunny woods, Honduras, Siltepec, No. 4409. Local name: "Contuhua Simarron."

Marsdenia mexicana Dcne.—In sunny thickets, Honduras, Siltepec, No. 4370.

Marsdenia Steyermarkii Woodson.—In woods, Pinabeto, No. 5457. New to Mexican flora.

Matelea gonoloboides (Rob. & G.) Woods.—In sunny thickets, Cascada, Siltepec, No. 1613.

Matelea inops Woods. Annals Miss. Bot. Gard. 28: 276. 1941.—In thickets, Cascada, Siltepec (type locality), No. 1731; in thickets, Mt. Ovando, No. 4199.

Matelea Pavonia (Dcne.) Woods.—In thickets, Finca Juárez, Escuintla, No. 1778.

Matelea yucatanensis (Standl.) Woods.—In thickets, Mazapa, No. 4814.

Metastelma angustifolium Turcy.—In woods, Rodeo, Siltepec, No. 4562.

Sarcostemma clausum (Jacq.) Schult.—In thickets, Turquia, Escuintla, Nos. 17032, 16841; in field, near beach, Paredon, Tonalá, No. 16945.

CONVOLVULACEAE

Aniseia cernua Moric.—In sandy field, Mojarra, Tonalá, No. 17127.

Calonyction aculeatum (L.) Honuse.—In wet thickets, Escuintla, No. 2135. Local name: "Guamol."

Calonyction ventricosum Hallier.—In open woods, at 1000 m. alt., Mt. Ovando, No. 6073; in sunny woods, Jilguero, Escuintla, No. 17292.

Cressa truxillensis HBK.—In field, Paredon, Tonalá, No. 16284.

Cuscuta corymbosa var. *grandiflora* Engl.—In open thickets, Cascada, Siltepec, No. 392.

Cuscuta jalapensis Schl.—In sunny thickets, near Aguas Calientes, north slope, Vol. Tacaná, No. 2401.

Evolvulus alsinoides L.—In grassy savanna land, Chicomuselo, No. 4450; in field, Paredon, Tonalá, No. 16948.

Evolvulus filipes Mart.—In grassy thickets, Cascada, Siltepec, No. 1619.

Evolvulus nummularius L.—In in wet ground, Mojarra, Tonalá, No. 17129.

Evolvulus sericeus Swartz.—In savanna, Chicomuselo, No. 18278.

Ipomoea crassicaulis (Benth.) Robinson.—In wet swampy low land, Las Garzas, Acapetahua, No. 2674. Often cultivated. In swamp, Mojarra, Tonalá, No. 17135. Local name: "Amapola."

Ipomoea Meyeri (Spreng.) D. Don.—In sandy thickets, Mojarra, Tonalá, No. 17240.

Ipomoea minuiiflora (Mart. & Gal.) House.—In thickets, near beach, Mojarra, Tonalá, No. 17113.

Ipomoea Nil (L.) Roth.—In sunny thickets, Esperanza, Escuintla, Nos. 17096, 17078. Local name: "Flor de verano."

Ipomoea pes-caprae (L.) Roth.—On sandy beach, Paredon, Tonalá, No. 16321.

Ipomoea polyanthes R. & S.—In thickets, Escuintla, No. 1045.

Ipomoea trifida (HBK.) G. Don.—In sunny bushy area, Esperanza, Escuintla, Nos. 17091, 17079, 2154.

Ipomoea triloba L.—In thickets, Escuintla, No. 828.

Jacquemontia nodiflora (Desr.) Don.—In thickets, Miramar, Escuintla, No. 1622.

Jacquemontia pentantha (Jacq.) In thickets, Escuintla, No. 986; in thickets, Acacoyagua, Nos. 17391, 17276.

Jacquemontia Perryana Duch. & Walp.—In sunny thickets, Mapastepec, No. 2000.

Jacquemontia Pringlei A. Gray.—In field, Paredon, Tonalá, No. 16324.

Merremia aegyptia (L.) Urban.—In sandy sunny thickets, near beach, Mojarra, Tonalá, Nos. 17192, 17341.

Merremia cissoides (Lam.) Hallier.—In thickets, Turquia, Escuintla, No. 17071.

Merremia quinquefolia (L.) Hallier.—In sunny thickets, Esperanza, Escuintla, Nos. 835, 939; in bushes, Mojarra, Tonalá, No. 17138. Local name: "Quebra Cantaro."

Merremia umbellata (L.) Hallier.—In thickets, near beach, Mojarra, Tonalá, Nos. 17324, 17122; in field, Rancho Quemado, Acapetahua, No. 17402.

Operculina alatis (Hook.) House.—In second sunny growth, Mt. Ovando, No. 6167; in open field, Turquia, Escuintla, Nos. 17075, 2161.

Quamoclit coccinea (L.) Moench.—In thickets, Escuintla, No. 847; in bushes, Aca-

coyagua, Nos. 17398, 17631.

Quamoclit grandiflora (L. & L.) G. Don.—In open woods, at 1500 m. alt., Mt. Ovando, No. 6190.

Quamoclit pennata (Boj.) Raf.—In sunny thickets, Mojarra, Tonalá, No. 17195.

Quamoclit vitifolia (Cav.) Donn.—In thickets, Esperanza, Escuintla, No. 990.

POLEMONIACEAE

Bonplandia geminiflora Cav.—In open pine woods, Mt. Pashtal, No. 135.

Cobaea pachysepala Standl.—In second growth, at 1900 m. alt., Mt. Ovando, No. 447.

Loeselia ciliata L.—In sandy, sunny field, Escuintla, Nos. 2297, 17501; in sandy field, Paredon, Tonalá, No. 16325; Mojarra, Tonalá, No. 17108.

Loeselia glandulosa (Cav.) Donn.—In open thickets, Mt. Ovando, Nos. 162, 18279; in woods, at 1300 m. alt., San Luis, Siltepec, N. 15283.

Loeselia mexicana (Lam.) Brand.—On sunny ridge, at 900 m. alt., Buena Vista, 40 km. northeast of Escuintla, No. 1874.

HYDROPHYLLACEAE

Hydrolea spinosa L.—In sunny swampy thickets, Acacoyagua, Nos. 2059, 17306, 18251.

Phacelia platycarpa (Cav.) Spreng.—In grassy field, Mt. Malé, No. 4611; in wet grassy field, Ventanas, Siltepec, No. 4553; in open, wet field, Vol. Tacaná, No. 2503; in field, at 2700 m. alt., Niquivil, No. 5496.

Wigandia caracasana H.B.K.—In riverside thickets, Cintalapa, Escuintla, No. 1068; also collected in Pinabeto and Mt. Ovando, in second growth. Local name: "San Pablo."

Wigandia Kunthii Choisy.—On sandy beach, Escuintla, No. 17408; on sunny ridge, near Unión Juárez, at 1400 m. alt., south slope, Vol. Tacaná, No. 2755; in woods, Cascada, Siltepec, No. 5142.

Wigandia Kunthii var. *intermedia* Brand.—In wet ravine, at 2538 m. alt., Pinabeto, Motozintla, No. 5473.

BORAGINACEAE

Bourreria huanita (Llav. & Lex.) Hemsl.—Cultivated, Escuintla, No. 629. Local name: "Jasmin de Oaxaca."

Bourreria Purpusii Brandeg.—In riverbank forest, Malpaso, Siltepec, No. 4526.

Cordia alliodora (R. & P.) Cham.—In secondary woods, Esperanza, Escuintla, No. 1086; in open forest, Mt. Ovando, No. 449. Local name: "Laurel."

Cordia ambigua Schl. & Cham.—In woods, Mt. Ovando, Nos. 771, 18232.

Cordia cana Mart. & Gal.—In open forest, Mt. Ovando, No. 683.

Cordia cordiformis Johnston.—In woods, Mt. Malé, No. 4590.

Cordia curassavica Roem. & Shult.—In bushes, near beach, Paredon, Tonalá, Nos. 16312, 16303. Local name: "Balita prieta."

Cordia dentata Poir., Syn. *Cordia alba*.—In open woods, Mojarra, Tonalá, No. 17112; in woods, near beach, Paredon, Tonalá, Nos. 16949, 16961; in woods, near beach, Paredon, Tonalá, No. 16299. Local name: "Gravel."

Cordia diversifolia Pavón.—In woods, Acacoyagua, Nos. 16783, 16397. Local name: "Gravel."

Cordia ferruginea R. & S.—In bushes, Chicomuselo, Nos. 4445, 4451; in sunny thickets, Escuintla, Nos. 606, 16497.

Cordia globosa (Jacq.) H.B.K.—In thickets, Mazapa de Mader, No. 4808; in open field, Mt. Malé, No. 4661; in woods, at 2000 m. alt., La Grandeza, No. 15594.

Cordia heterophylla Roem. & Schult.—In woods, Nandolopez, Acapetahua, No. 16658; in sandy woods, Cacaluta, Escuintla, Nos. 16374, 16676. Local name: "Gravel Simacron."

Ehretia Luxiana D. Sm.—In open forest, Mt. Ovando, No. 495.

Ehretia tinifolia L.—Cultivated in open door, Escuintla, No. 16607; in woods, Paredon, Tonalá, No. 16951. Local name: "Mambimbo."

Hackelia costaricensis (Brand.) J. M. Johnston.—In grassy wet margin of woods, at 2500 m. alt., Pinabeto, Motozintla, Nos. 5465, 18233.

Hackelia mexicana (C. & S.) Johnston.—In grassy field, Vol. Tacaná, No. 2351; in stony field, Mt. Malé, No. 4698.

Heliotropium curassavicum L.—In grassy field, Acapetahua, No. 2738; in grassy wet field, Paredon, Tonalá, Nos. 16282, 16908.

Heliotropium fruticosum L.—In open woods, Mt. Malé, No. 4626.

Heliotropium indicum L.—In roadside thickets, Acacoyagua, No. 17622.

Tournefortia bicolor Swartz.—In roadside bushes, Mapastepec, No. 17525; in thickets, Macutián, Acapetahua, No. 17468; in thickets, Belem, near beach, Mapastepec, No. 17596.

Tournefortia glabra L.—In forest, north slope, Vol. Tacaná, No. 2985; in woods, at 2560 m. alt., Pinabeto, Motozintla, No. 5469; Huicisil, Mt. Madre Vieja, No. 16730.

Tournefortia hirsutissima L.—In second growth, Barranca Honda, Siltepec, No. 4130; in secondary thickets, Acacoyagua, Nos. 16446, 17529; in woods, at 700 m. alt., Piñuela, Escuintla, No. 17571.

Tournefortia petiolaris DC.—In woods, Cascada, Siltepec, N. 1055.

Tournefortia Schomburgkii DC.—In roadside thickets, Acacoyagua, No. 16372.

VERBENACEAE

Aegiphila costaricensis Moldenke.—In forest, Esperanza, Escuintla, at 200 m. alt., No. 17395; in wet forest, Mt. Ovando, Nos. 572, 2101, 6152. Previously distributed as "*Cleodendron Matudai* Standl."

Aegiphila elata Swartz.—In sunny bushy area, Esperanza, Escuintla, No. 16624. Local name: "Taco," "Taquito."

Aegiphila falcata Donn. Sm.—In woods, Escuintla, No. 666. Local name: "Taco," "Taquito."

Aegiphila paniculata Moldenke.—In forest, La Grada, Escuintla, No. 16791.

Aegiphila panamensis Moldenke.—In woods, Escuintla, No. 2115.

Aegiphila Skutchii Moldenke.—In open woods, Mt. Ovando, No. 4190; in second growth, Mt. Pashtal, No. 1653.

Aegiphila Valerii Standl.—In sunny, sandy woods, Mapaza, No. 4876; in woods, Santa Rita, Mapastepec, No. 2017.

Aegiphila wigandioides Lundell, Contr. Univ. Mich. Herb. 8: 81. 1942.—In woods, at 1600 m. alt., Santa Rosa, Escuintla (type locality), No. 4253.

Avicennia nitida Jacq.—In woods, near beach, Las Garzas, Acapetahua, No. 2728. Local name: "Madre de Sal."

Bouchea Nelsonii Grenz.—In thickets, near beach, Paredon, Tonalá, No. 16922.

Callicarpa acuminata H.B.K.—In open thickets, Mt. Pashtal, No. 1011.

Citharexylum Mocini D. Donn.—In woods, Haciendita, Siltepec, No. 1884; in open forest, Ventana, Siltepec, No. 4537; in cloud forest, Tres Cruces, Sierra Madre, at 2300 m. alt., No. 5014.

Citharexylum Mocini var. *longibracteatum* Moldenke.—In open forest, at 1900 m. alt., Mt. Ovando, Nos. 3923, 16264.

- Citharexylum pterocladum* Donn. Sm.—In forest, Mt. Madre Vieja, Escuintla, No. 2522.
- Clerodendron fragrans* Vent.—Cultivated, often escaped, Escuintla, No. 16475. Local name: "Flor de Concha."
- Clerodendron japonicum* (Thub.) Sw.—Cultivated in Escuintla, No. 541.
- Clerodendron ligustrum* (Jacq.) R. Br.—In sandy bushy area, Arista, Tonalá, No. 17323.
- Clerodendron Moldenkeanum* Standl. Field Mus. Bot. 22: 99. 1940.—In woods, south slope, near Unión Juárez, Vol. Tacaná (type locality), No. 2760.
- Clerodendron speciosissimum* Van Geert.—Cultivated, in Esperanza, Escuintla, No. 16708.
- Clerodendron Thomasonae* Balt.—Cultivated, Acacoyagua, No. 17699. Local name: "Arete de India."
- Cornutia grandifolia* (Schl. & Cham.) Schau.—In wet open thickets, Mt. Pashtal, No. 1652.
- Cornutia grandifolia* var. *Purpusii* Moldenke.—In woods, south slope of Mt. Ovando, at alt. 1000 m., No. 17872.
- Duranta repens* L.—Cultivated in Escuintla, Nos. 515, 17488. Local name: "Colera de Novio."
- Duranta repens* L. forma *alba*.—Cultivated, Escuintla, No. 17489.
- Lantana camara* var. *mista* (L.) L. H. Bailey.—In grassy thickets, Acacoyagua, No. 2177; in sunny field, Mojarra, Tonalá, No. 17117. Local name: "Venturosa," "Cinco Negro." "
- Lantana hispida* HBK.—In thickets, Jilguero, Escuintla, No. 17260.
- Lantana horrida* H.B.K.—In savanna thickets, Chicomuselo, No. 4427.
- Lippia alba* (Mill.) N. E. Br.—In sunny field, Santa Elena, Acapetahua, Nos. 1478, 16645; in field, at 2000 m. alt., Frailesca, Siltepec, No. 5213.
- Lippia cardiostegia* Benth.—In grassy thickets, Siltepec, No. 1670.
- Lippia Kellermanii* Greenm.—In open thickets, Mt. Ovando, No. 122; in thickets, Siltepec, No. 1541.
- Lippia myriocephala* Cham. & Schlecht.—In grassy thickets, Miramar, Ojo de Agua, No. 610; in thickets, Siltepec, Nos. 849, 5300; in thickets, Mt. Ovando, No. 707.
- Lippia nodiflora* (L.) Michx.—In field, near beach, Paredon, Tonalá, No. 17028.
- Lippia pinetorum* Moldenke, Phytologia 2: 21. 1941.—In grassy pine woods, Mt. Ovando (type locality), No. 3925. Previously distributed as *L. cardiostegia* Benth.
- Lippia substrigosa* Turcz.—In thickets, Cascada, at 1500 m. alt., Siltepec, No. 5149.
- Petrea volubilis* L.—In sandy, sunny thickets, Escuintla, Nos. 1478, 17492. Often cultivated. Local name: "Capitan Lila."
- Phyla scaberrima* (A. L. Juss.) Moldenke.—In grassy field, Santa Rosa, Escuintla, No. 4225.
- Priva aspera* H.B.K.—In thickets, Siltepec, No. 1684; in grassy thickets, Mazapa de Madero, Nos. 4821, 4885.
- Stachytarphata guatemalensis* var. *Lundelliana* Moldenke, Phytologia 1: 430. 1940.—In thickets, at 1800 m. alt., Santa Rosa, Escuintla, No. 4242; in open wet thickets, Finca Juárez, Escuintla (type locality), No. 1762; in margin of forest, Honduras, Siltepec, No. 4372. Previously distributed as *S. Frantzii* Polak.
- Verbena carolina* L.—In thickets, north slope, Vol. Tacaná, No. 2496; in open thickets, at 1500 m. alt., Mt. Ovando, Nos. 16217, 1934.
- Verbena litoralis* H.B.K.—In thickets, Mt. Ovando, No. 438; in thickets, at 1500 m. alt., San Luis, Siltepec, No. 5302; in second growth, at 1600 m. alt., Frailesca, No. 5193.
- Vitex Gaumeri* Greenm.—In sandy woods, Esperanza, Escuintla, No. 3905.
- Vitex Kylenei* Standl.—In sandy woods, Cacaluta, Escuintla, No. 16490. Local name: "Tapisajuate"

LABIATAE

- Asterohyptis Mociniana* (Benth.) Epling.—In pine woods, Mt. Ovando, No. 2070.
- Catopheria chiapensis* Gray.—In woods, Finca Olvido, Montecristo, No. 2038.
- Chaenostoma megistandrum* Don. Sm.—In sunny thickets, at 2000 m. alt., Mt. Ovando, Nos. 427, 16213; also collected in Mt. Boqueron. Previously known from Guatemala, new to Mexican flora.
- Coleus Blumei* Benth.—Cultivated in garden, Escuintla, No. 16433. Local name: "Manto."
- Cunila polyantha* Benth.—In thickets, Pinada, Siltepec, Nos. 2005, 5113; in woods, Mt. Ovando, No. 140; in woods, Mt. Pashtal, No. 1650.
- Hyptis brevipes* Poit.—In thickets, Mojarra, Tonalá, No. 17226.
- Hyptis capitata* Jacq.—In grassy field, Cintalapa, Escuintla, No. 17275.
- Hyptis conferta* Pohl.—In field, Rancho Quemado, Acapetahua, Nos. 17400, 17257.
- Hyptis Mociniana* Benth.—In sandy field, Sta. Rosa, Tonalá, No. 17355.
- Hyptis mutabilis* (Pich.) Brig.—In grassy thickets, Escuintla, Nos. 2124, 17069; in second growth, Mt. Ovando, No. 2562.
- Hyptis pectinata* (L.) Poit.—In thickets, Mt. Ovando, No. 6189.
- Hyptis suaveolens* (L.) Poit.—In sandy thickets, Mojarra, Tonalá, Nos. 17236, 16954.
- Hyptis urticoides* Kunth.—In margin of woods, Cascada, Siltepec, Nos. 527, 1061; in woods, Mt. Ovando, Nos. 141, 440, 6155; in thickets, Escuintla, No. 181; in second growth thickets, at 2000 m. alt., Vol. Tacaná, No. 2474.
- Marsiphanthes Chamaedrys* (Vahl.) Kuntze.—In dry thickets, Escuintla, No. 2145.
- Ocimum micranthum* Willd.—In bushes, Nuevo Amatenango, No. 4785; in dry field, Chicomuselo, No. 4469; cultivated, Acacoyagua, No. 16784. Local name: "Albajaca Simarron."
- Salvia albiflora* M. & G.—In grassy field, Escuintla, No. 178; in grassy thickets, Mazapa, No. 4878.
- Salvia cinnabarina* M. & G.—In edge of forest, at 1500 m. alt., north slope, Vol. Tacaná, Nos. 2306, 2494, 2773.
- Salvia compacta* Kuntze.—In pine woods, Mt. Ovando, No. 4009; in Barranca Honda, Siltepec, No. 4126.
- Salvia hyptioides* M. & G.—In thickets, Escuintla, Nos. 152, 2300; in sandy sunny thickets, Jilguero, Escuintla, No. 17267.
- Salvia infusca* Epling, Publ. Univ. Calif. Biol. 2: 209. 1940.—In mixed forest, Barranca Honda, Siltepec, No. 4046; in pine woods, Santa Rita, Mapastepec (type locality), No. 2000.
- Salvia ionocalyx* Epling, Publ. Univ. Calif. Biol. 2: 31. 1940.—In wet edge of forest, Mt. Pashtal, Sierra Madre (type locality), No. 134; in pine woods, Pinada, Siltepec, No. 1903.
- Salvia Karwinskii* Benth.—In grassy thickets, Siltepec, No. 145; in edge of forest, near Chiquihuite, Vol. Tacaná, No. 2826.
- Salvia lavanduloides* Kunth.—In grassy ridge, Mt. Ovando, No. 123; in woods, Pinada, Siltepec, No. 1950; in open woods, at 2500 m. alt., Vol. Tacaná, Nos. 2446, 2819.
- Salvia Matudae* Epling, Publ. Univ. Calif. Biol. 2: 331. 1940.—In wet woods, Siltepec, No. 173; in wet margin of forest, Mt. Pashtal (type locality), No. 138; in wet edge of forest, Haciendita, Siltepec, No. ex-S.
- Salvia membranacea* Benth.—In wet ravine, near Chiquihuite, Vol. Tacaná, No. 2843.
- Salvia microphylla* H.B.K.—In second growth, at 1500 m. alt., Vol. Tacaná, No. 2478.
- Salvia Mocinoi* Benth.—In open woods, at 1800 m. alt., Haciendita, in Sierra Madre, 60 km. northeast of Escuintla, No. 18222.

Salvia polystachya Ortega.—In mixed forest, Mt. Ovando, at alt. 1500 m., No. 17759.

Salvia purpurea Cav.—In wet thickets, Barranca Honda, Siltepec, Nos. 4119, 5220; in open thickets, Mt. Ovando, No. 148; in wet shaded edge of forest, Escuintla, No. 156; on brook side, Unión Juárez, No. 2797.

Salvia rubiginosa Benth.—In margin of pine woods, Pinada, Siltepec, Nos. 1895, 1949; in edge of forest, Escuintla, No. 2127.

Salvia splendens Sellow.—Cultivated, Unión Juárez, No. 2790. Previously unreported from Mexico.

Salvia tiliaefolia Vahl.—In wet thickets, Siltepec, No. 175.

Salvia vitiifolia Benth.—In open pineland, Saxchanal, No. 4310; in woods, Ventana, Siltepec, No. 4538; in wet forest, Mt. Malé, No. 4684.

Salvia Wageneriana Polak.—On wet brook side, Barranca Honda, Siltepec, No. 4128; in wet ravine, Vol. Tacaná, No. 2972. Previously reported from Guatemala, Salvador and Costa Rica; new to Mexican flora.

Salvia xalapensis Benth.—In thickets, Escuintla, No. 122; in pine woods, Mt. Malé, No. 4669.

Satureja Seleriana Loes.—In wet woods, at 3200 m. alt., Mt. Malé, No. 4617.

Stachys coccinea Jacq.—In wet woods, Siltepec, No. 174; in pine woods, Mt. Malé, No. 4646.

Stachys Lindenii Benth.—On wet ridge, at 1700 m. alt., Frailesca, Siltepec, No. 5237.

Stachys Lindenii Benth. var. *aristulata* Epling.—In edge of forest, north slope, Vol. Tacaná, No. 2310.

SOLANACEAE

Acnistus arborescens Schl.—In woods, at 2100 m. alt., north slope, Vol. Tacaná, No. 2408; in wet open woods, Boqueron, No. 15408.

Acnistus macrophyllus (Benth.) Standl.—In woods, north slope, Vol. Tacaná, No. 2946.

Brachistus lanceolatus Greenm.—In forest, north slope, Vol. Tacaná, No. 2438.

Browallia americana L.—In forest, Siltepec, Nos. 137, 260.

Brunfelsia nitida Benth.—Cultivated in open garden, Escuintla, No. 16613. Local name: "Galan de Noche."

Brunfelsia nyctaginoides Standl.—In grassy field, near Aguas Calientes, north slope, Vol. Tacaná (type locality), Nos. 2411, 2969; in open woods, at 2300 m. alt., Mt. Boqueron, No. 5350; in cloud field, Coshocal, near Cascada, at 2000 m. alt., Siltepec, No. 5068. New genus and species to Mexican flora.

Capsicum annum L.—Cultivated, Esperanza, Escuintla, No. 17642. Local name: "Chile Chocolate."

Capsicum frutescens var. *baccatum* (L.) Irish.—Cultivated, in Escuintla, No. 17590. Local name: "Chile siete caldo."

Capsicum lanceolatum (Greenm.) Morton & Standl.—In woods, Cascada, Siltepec, at 1600 m. alt., No. 5177.

Capsicum stramineifolium (H.B.K.) Kuntze.—In secondary thickets, San Nicolás, Montecristo, No. 1932; in thickets, Vol. Tacaná, No. 2475; in wet forest, Mt. Ovando, No. 2586; in open woods, Escuintla, No. 1865; in shaded woods, at 1700 m. alt., Frailesca, Siltepec, No. 5206.

Cestrum anagyris Dunal.—In forest, at 2800 m. alt., wet slope, Vol. Tacaná, No. 2901.

Cestrum aurantiacum Lindl.—In open woods, Letrero, Siltepec, Nos. 4330, 4343; in secondary woods, Siltepec, No. 1673.

Cestrum Baenitzii Lingelsh.—In wet woods, at 1000 m. alt., Mt. Ovando, No. 16245.

Cestrum chiapensis Brandeg.—In secondary woods, at 1600 m. alt., Santa Rosa, Escuintla, No. 4248, also collected at Mt. Boqueron.

Cestrum guatemalensis Morton.—In second growth, near Chiquihuite, Vol. Tacaná, No. 2831. It seems new to Mexican flora.

Cestrum glanduliferum Francey.—In woods, Mt. Ovando, No. 657 (fl.), No. 2089; in forest, Haciendita, Escuintla, No. 1882 (fr.).

Cestrum lanatum M. & G.—In forest, Mt. Ovando, No. 657.

Cestrum nocturnum L.—In thickets, Siltepec, No. 1673; in thickets, Nuevo Amatenango, No. 4722. Local name: "Huele de Noche." Very common, from sea level to 1700 m. alt., on both sides of Sierra Madre.

Cestrum scandens Vahl.—In thickets, near Las Garzas, Acapetahua, No. 2669.

Cestrum terminale Francey.—In forest, Mt. Pashtal, No. 496.

Cestrum Warszewiczii var. *macrocalyx* Francey.—In wet woods, Mt. Pashtal, No. 497.

Cestrum yucatanense Francey.—In woods, Mt. Pashtal, No. 451.

Cyphomandra betacea Sendtn.—In open thickets, at 1900 m. alt., Mt. Ovando, No. 16215; in Frailesca, Siltepec, No. 5195. Local name: "Tomate de Palo."

Cyphomandra Rojasiana Standl. & Steyerl.—In thickets, along roadside, to Finca California, Col. Tuxtla, Escuintla, No. 16553. Known from Guatemala, new to Mexican flora.

Datura arborea L.—Cultivated. Local name: "Campana."

Datura fastuosa L.—Temperate zone, No. 246, often cultivated.

Datura Metel L.—In thickets, Paredon, Tonalá, No. 16937.

Juanulloa mexicana (Schl.) Miers.—In dry woods, trees, Mazapa, No. 4842; in sunny forest, on trees, Esperanza, Escuintla, Nos. 492, 17444.

Lycianthes arrazolensis (Coul. & D. Smith) Bitter.—In shaded forest, Boqueron, Motozintla, No. 15373; in open woods, San Luis, at 1500 m. alt., Siltepec, No. 5975.

Lycianthes heteroclita (Sendtn.) Bitter.—In wet woods, at 200 m. alt., Esperanza, Escuintla, Nos. 2141, 17477. Local name: "Quilete."

Lycianthes lenta (Cav.) Bitter.—In thickets, Las Garzas, Acapetahua, Nos. 2708, 2804.

Lycianthes obliquifolia Standl. Field, Mus. Bot. 22: 101. 1940.—In open grassy thickets, at 2800 m. alt., west slope, Vol. Tacaná (type locality), No. 2938.

Lycianthes tricolor (Moc. & Sessé) Bitter.—In wet woods, Letrero, Siltepec, No. 4350.

Lycianthes sp.—In forest, at 1600 m. alt., Santa Rosa, near Escuintla, No. 4249.

Lycianthes sp.—In sandy thickets, Mazapa, No. 4868.

Lycianthes sp.—In woods, at 3200 m. alt., Mt. Malé, No. 4656.

Markea uniflora Lundell, Phytologia 1: 340. 1939, Field Mus. Bot. 22: 171. 1940.—In forest, near Chiquihuite, Vol. Tacaná (type locality), No. 2816; in open forest, at 2786 m. alt., Niquivil, near Guatemalan border, No. 5499.

Melananthus guatemalensis (Benth.) Solereder.—In sandy thickets, at about 900 m. alt., Malpaso, Siltepec, No. 4518.

Nicandra physaloides (L.) Gaertn.—In woods, Finca Juárez, N. 1746; in wet thickets, Siltepec, No. 248.

Physalis chimalteca Standl. & Steyerl.—In woods, Siltepec, Nos. 254, 250; in wet woods, at 1600 m. alt., Frailesca, Siltepec, No. 5199. Reported recently from Guatemala, new to Mexican flora.

Physalis micrantha Link.—In uncultivated grassy field, Mojarra, Tonalá, Nos. 17225, 17189.

Physalis mollis Nutt.—In second growth, Esperanza, Escuintla, No. 239.

Petunia axillaris (Lam.) B.S.P.—In open woods, Finca Juárez, Escuintla, No. 4147.

- Saracha procumbens* (Cav.) R. & P.—In grassy thickets, Mt. Ovando, Nos. 1833, 4191; in field, Escuintla, No. 242; in open thickets, San Vicente, Tapachula, No. 2511.
- Solandra grandiflora* Sw.—Woody vine, in advanced forest, Mt. Ovando, No. 4222.
- Solandra nitida* Zucc.—Woody gigantic vine, in woods, Boqueron, Motozintla, No. 15346.
- Solanum aculeatissimum* Jacq.—In wet thickets, Las Garzas, Acapetahua, No. 2681.
- Solanum aligerum* Schl.—In wet thickets, Mt. Pashtal, No. 1707; in thickets, near Chiquihuite, Vol. Tacaná, No. 2837.
- Solanum amatitlanense* Coul. & D. Sm.—In woods, Mt. Pashtal, N. 1642.
- Solanum appendiculatum* Dunal.—In woods, at 2585 m. alt., Pinabeto, near Motozintla, No. 5464; in forest, at 1500 m. alt., Frailesca, Siltepec, No. 5249.
- Solanum arrazcense* Coul. & D. Sm.—In open woods, Siltepec, N. 1672; in woods, Mt. Ovando, No. 960; in woods, Letrero, Siltepec, No. 4364.
- Solanum bicolor* Willd.—In second growth bushes, Mt. Ovando, No. 6137; in woods, wet river side, at 1900 m. alt., Frailesca, No. 5196.
- Solanum brachystachys* Dunal.—In open pine woods, Mt. Ovando, No. 432; in woods, Mt. Pashtal, No. 458; in thickets, Saxchanal, Sierra Madre, No. 4289.
- Solanum Cervantesii* Lag.—In woods, at 1200 m. alt., Mt. Ovando, No. 17760.
- Solanum diphyllum* L.—In wet field, Col. Soconusco, Acapetahua, No. 16584; in sandy thickets, near beach, Mojarra, Tonalá, No. 17211.
- Solanum Donnell-Smithii* Coul.—In thickets, Esperanza, Escuintla, No. 2624.
- Solanum elaeagnifolium* Cav.—In second growth, at 2000 m. alt., Mt. Ovando, No. 238.
- Solanum ferrugineum* Jacq.—In second growth, Esperanza, Escuintla.
- Solanum Hartwegii* Benth.—In open thickets, Escuintla, No. 243.
- Solanum hirtum* Vahl.—In bushes, Acacoyagua, No. 17620.
- Solanum hispidum* Pers.—In thickets, Siltepec, No. 249; in thickets, Mt. Ovando, No. 1567.
- Solanum laurifolium* Mill.—In grassy thickets, Siltepec, No. 253; in thickets, Vol. Tacaná, Nos. 2844, 2990.
- Solanum Lundellii* Standl.—In woods, Cacaluta, Acacoyagua, No. 16872.
- Solanum macrantherum* Dunal.—In forest, Finca Juárez, No. 1774; in thickets, at 1200 m. alt., Mazapa, No. 4812.
- Solanum nigrum* L.—In uncultivated field, Acacoyagua, Nos. 257, 1296; in pineland, at 2700 m. alt., Mt. Malé, No. 4618. Local name: "Yerva Mora."
- Solanum nigricans* Mart. & Gal.—In cloud forest, at 2000 m. alt., Mt. Pashtal, Nos. 17678, 17817.
- Solanum nudum* H.B.K.—In thickets, Mt. Ovando, No. 252; in field, Mt. Pashtal, Nos. 465, 17683; in thickets, Vol. Tacaná, No. 2849.
- Solanum Ochraceo-ferrugineum* (Dunal) Fernald.—In sandy thickets, Paredon, Tonalá, No. 16343.
- Solanum ovandense* Lundell, Amer. Midl. Nat. 29: 490. 1943.—Herbaceous vine, on trunk, in wet forest, at 1500 m. alt., Mt. Ovando (type locality), No. 4182.
- Solanum quichense* Coul. & D. Sm.—In thickets, Mt. Pashtal, No. 255.
- Solanum Rovirosanum* Donn. Smith.—In cloud forest, at 2200 m. alt., Frailesca, Siltepec, Nos. 15255, 5141.
- Solanum Seafortianum* Andr.—Cultivated, Acacoyagua, No. 17531.
- Solanum suaveolens* Kunth & Bauché.—In cloud forest, at 2300 m. alt., Frailesca, Siltepec, No. 5246.
- Solanum tacanense* Lundell, Amer. Midl. Nat. 29: 490. 1943.—Herbaceous vine, in forest, at 2000 m. alt., north slope, Vol. Tacaná (type locality), No. 2958.

Solanum umbellatum Mill.—In open thickets, San Nicolás, Montecristo, No. 1963; in riverside woods, at 2000 m. alt., La Grandeza, No. 5565.

Solanum verbascifolium L.—In sandy thickets, Acacoyagua, Nos. 245, 17290; in sandy sunny thickets, Siltepec, No. 251. Local name: "Verengena."

Solanum Wendlandii Hoof. f.—Cultivated, Escuintla, Nos. 671, 17481; common in temperate zone. Local name: "Quishtan."

SCROPHULARIACEAE

Alonsoa meridionalis (L. f.) Kuntze.—In edge of wet forest, Mt. Ovando, No. 524, also collected in Mt. Pashtal.

Angelonia angustifolia Benth.—In wet grassy field, Sta. Elena, Acapetahua, No. 16688; in grassy thickets, near beach, Belem, Mapastepec, No. 17594.

Bacopa procumbens (Sw.) Pers.—In savanna land, Chicomuselo, No. 4431.

Bacopa repens (Sw.) Wellst.—In wet field, Esperanza, Escuintla, No. 16864.

Bacopa Salzmannii (Benth.) Chod. & Hassl.—In sunny grassy savanna field, Chicomuselo, No. 4459.

Buchnera lithospermifolia HBK.—In thickets, at 1500 m. alt., Vol. Tacaná, No. 18237.

Buchnera pusilla HBK.—In open field, San Luis, at 1500 m. alt., Siltepec, No. 5311; in open thickets, Cacaluta, Acacoyagua, No. 16886; in field, Santa Elena, Acapetahua, Nos. 17250, 17403; in pineland, at 2000 m. alt., Montecristo, No. 1959; in woods, Barranca Honda, Siltepec, No. 4100.

Capraria biflora L.—In thickets, Nuevo Amatenango, No. 4734; in field, Paredon, Tonalá, Nos. 17025, 16338; in field, Cerrito, Acapetahua, No. 16758.

Calceolaria mexicana Benth.—In thickets, Siltepec, No. 865; in thickets, Mt. Ovando, No. 2192; in thickets, Finca Juárez, near Escuintla, No. 1781; in wet woods, at 2000 m. alt., Vol. Tacaná, No. 18289; in forest, at 2500 m. alt., Boqueron, No. 5403.

Castilleja arvensis Cham. & Schl.—In second growth, San Luis, at 1300 m. alt., Siltepec, No. 5286; in open woods, at 1600 m. alt., Mt. Ovando, No. 18207; in sandy soil, Cintalapa, Escuintla, Nos. 17424, 17423; in open woods, at 2500 m. alt., Tres Cruces, Sierra Madre, No. 5045.

Castilleja chiapensis Brandeg.—In open grassy field, or pine woods, on the way to Mt. Pashtal, Miramar, No. 129.

Castilleja communis Benth.—In margin of forest, Salina, Montecristo, No. 1955; in sunny field, Mt. Ovando, No. 143; in sunny field, at 2100 m. alt., north slope, Vol. Tacaná, No. 2974.

Castilleja glandulosa Greenm.—In open thickets, Mt. Ovando, No. 168.

Castilleja integrifolia L. f.—In open field, north slope, Vol. Tacaná, No. 2354.

Conohea pusilla (Benth.) Benth. & Hook.—In savanna field, Chicomuselo, No. 4434.

Digitalis purpurea L.—In grassy field, Pinabeto, to Niquivil, Motozintla, No. 5445.

Escobedia longiflora Pennell.—In dry field, Mazapa de Madero, No. 18236.

Ghiesbreghtia grandiflora A. Gray.—On dry hill ridge, Mazapa de Mader, No. 4855.

Hemichaena fruticosa Benth.—In open sunny thickets, Mt. Ovando, Nos. 131, 16262; in cloud forest, at 2300 m. alt., Tres Cruces, Sierra Madre, No. 5040; in wet cloud forest, at 2500 m. alt., Mt. Pashtal, No. 17674.

Herpestis repens (Sw.) G. & S.—In wet field, near Escuintla, at the foot of Mt. Ovando, No. 2158.

Lamourouxia cordata S. & C.—In sandy pine woods, Mt. Ovando, No. 167.

Lamourouxia lanceolata Benth.—In wet grassy field, Chiquihuite, Vol. Tacaná, No. 2842; in sunny thickets, Mt. Ovando, No. 2647; in thickets, near Ojo de Agua, Mt. Pashtal, No. 130; in pine woods, Mt. Pashtal, No. 793; in sunny wet field, Cascada, at 1600 m. alt., Siltepec, No. 5084.

Lamourouxia multifida H.B.K.—In dry thickets, Mazapa de Madero, No. 4889; in sandy field, at 2000 m. alt., Vol. Tacaná, No. 2430.

Lamourouxia stenoglossa H. & S.—In pine woods, at 3000 m. alt., Tacaná, No. 2335. Previously distributed as "*L. montana* Hunn. & Sm."

Lamourouxia viscosa H.B.K.—In grassy field, near Unión Juárez, Vol. Tacaná, No. 2757; in pineland, Montecristo, No. 1962.

Leucocarpus perfoliatus (H.B.K.) Benth.—On river side, Finca Suiza, Montecristo, No. 1931.

Maurandya erubescens Gray.—In grassy thickets, at 2000 m. alt., north slope. Vol. Tacaná, No. 2359; in wet grassy margin of forest, Chiquihuite south slope of Vol. Tacaná, No. 2827.

Melasma hispidum (Schl. & Cham.) Benth.—In woods, at 1300 m. alt., Barranca Honda, Siltepec.

Mimulus glabratus H.B.K.—In wet field, Ventanas, Siltepec, No. 4552.

Mimulus pachystylus Grant.—In cloud forest, at 2100 m. alt., Frailesca, Siltepec, No. 5234; in woods, Santa Rosa, Escuintla, No. 4246.

Pentstemon barbatus Natt.—On sandy open ground, Mt. Ovando, No. 155.

Pentstemon gentianoides (H.B.K.) Don.—On volcanic rock, at 3000-4000 m. alt., Vol. Tacaná, No. 2330.

Russelia chiapensis Lundell, Field & Labo. 13: 12. 1945.—In open sunny thickets, Mt. Ovando (type locality), Nos. 2088, 2563.

Russelia equisetiformis Zucc.—Cultivated, Esperanza, Escuintla, No. 17085. Local name: "Rubia."

Russelia flavovirides Blake.—In open field or in pine woods, Mt. Pashtal, No. 1643.

Russelia glandulosa Pennell, in Sched.—In sunny field, Siltepec (type locality), No. 136.

Russelia polyedra Zucc.—In woods, at 1600 m. alt., San Luis, Siltepec, No. 5976.

Russelia verticillata HBK.—In grassy field, Santa Elena, Acapetahua, No. 17251; in open sandy thickets, near beach, Santa Rosa, Tonalá, No. 17336; in sandy thickets, Jilguero, Escuintla, No. 17273; in field, at 2000 m. alt., Frailesca, Siltepec, No. 5188.

Scoparia dulcis L.—In secondary thickets, Malpaso, Siltepec, No. 4513.

Sibthorpia pichinchensis H.B.K.—In grassy thickets, Mt. Ovando, No. 2191; in grassy edge of forest, north slope, Vol. Tacaná, Nos. 2373, 2593, 2959.

Stemodia peduncularis Benth.—In pine woods, at 2100 m. alt., north slope, Vol. Tacaná, No. 2962; in pine woods, Mt. Ovando, No. 177; in grassy pine woods, Salina, Montecristo, No. 2090.

Torenia Fournieri Linden.—Cultivated in gardens, Escuintla, No. 16426. Local name: "Perro."

BIGNONIACEAE

Amphilophium paniculatum (L.) H.B.K.—In open bushes, Chicomuselo, No. 4498; in thickets, Honduras, Siltepec, No. 4405.

Amphilophium paniculatum var. *molle* (Schl. & Cham.) Standl.—In thickets, Ojo de Agua, the foot of Mt. Pashtal, No. 609; in thickets, Letrero, Siltepec, No. 4347; in bushes, San Nicolás, Montecristo, No. 6099; thickets, at 2066 m. alt., La Grandeza, No. 15588.

Arrabidaea chica Vertol.—In forest, Esperanza, Escuintla, No. 17542; in woods, Cacaluta, Acacoyagua, No. 16870; in riverside woods, Chicomuselo, No. 5644.

Arrabidaea floribunda (H.B.K.) Loes.—In thickets, Esperanza, Escuintla, No. 1565.

Arrabidaea litoralis (H.B.K.) Standl.—In sandy thickets, Mazapa, No. 4837.

Clytostoma ocositense (Donn. Smith.) Seibert.—In bushes, near beach, Cerrito Acapetahua, No. 16759.

Crescentia alata H.B.K.—In sandy sunny woods, Arista, Tonalá, No. 17365.

Crescentia Cujete L.—Cultivated, Escuintla, No. 16818. Local name: "Palo de Huacal." Cultivated, Escuintla. Local name: "Jicara."

Cyrtanthus Donnell-Smithii (Rose) Seibert.—In forest, Esperanza, Escuintla, No. 6130. Local name: "Primavera," "Palo Blanco."

Cydista potosina (Schum. & Loes.) Loes.—In forest, at 150 m. alt., Esperanza, Escuintla, No. 16589.

Cydista diversifolia (HBK.) Miers.—In woods, near beach, Paredon, Tonalá, No. 16956.

Doxantha unguis-cati (L.) Rehder.—In woods, at 700 m. alt., Piñuela, Escuintla, No. 17568. Local name: "Bejuco de Sinaca."

Enallagma sessilifolia (S. Sm.) Standl.—In forest, Haciendita, Siltepec, No. 1944; in wet forest, Mt. Ovando, Nos. 1818, 4206; in wet forest, at 900 m. alt., Cordega, Pueblo Nuevo Comaltitlán, No. 17649. Local name: "Jicara de Mono."

Godmania aciculifolia (H.B.K.) Standl.—In savanna woods, Chicomuselo, No. 4442; in sandy wood, Escuintla, Nos. 1798, 16620. Local name: "Roble de Playa."

Parmentiera edulis DC.—In woods, Chicomuselo, No. 4491; often cultivated. Local name: "Cuajilote."

Petastoma patelliferum (Schl.) Miers.—In woods, Siltepec, No. 1608; in woods, Acacoyagua, No. 17246; in woods, Turquia, Escuintla, No. 17037. Local name: "Bejuco Tronador."

Pseudocalymma macrocarpum (Donn. Sm.) Sandw.—In woods, near beach, Las Garzas, Acapetahua, No. 2679; in woods, Aguas Calientes, Escuintla, No. 16610.

Tabebuia pentaphylla (L.) Hemsl.—In woods, Esperanza, Escuintla, Nos. 1687, 17455, 17606. Local name: "Palo Blanco," "Roble," "Roble Blanco."

Tecoma mollis H.B.K.—In secondary thickets, Honduras, Siltepec, No. 4414.

Tecoma stans (L.) H.B.K.—In sandy woods, Arista, Tonalá, No. 17331.

Tourretia lappacea (L'Her.) Willd.—In sunny thickets, Barranca Honda, Siltepec, No. 4044; in sandy ravine, at 1500 m. alt., on north slope, Vol. Tacaná, No. 2434.

MARTYNIACEAE

Martynia annua L.—Cultivated, Acacoyagua, Escuintla, Nos. 552, 16777. Local name: "Cazan Pulga."

OROBANCHACEAE

Conopopholis americana (L.) Wallr.—Parasite; in dry or moist forest, Mt. Ovando, No. 2641; in woods, at 1600 m. alt., Cascada, Siltepec, No. 5050.

GESNERIACEAE

Achimenes calycina Morton-Sp. Nov., in Sched.—In sunny ravine, Finca Juárez, Escuintla (type locality), No. 1766.

Achimenes longiflora DC.—In wet edge of forest, Motozintla, No. 4890; in brook edge, Nuevo Amatenango, No. 4781; in grassy, sunny wet edge of forest, or on brook side, near Unión Juárez, at 1700 m. alt., Vol. Tacaná, No. 2513.

Achimenes pedunculata Benth.—In wet ravine, Cascada, Siltepec, No. 1728; in wet edge of forest, Barranca Honda, Siltepec, No. 4063.

Achimenes pulchella (L. H.) Hitchc.—On wet grassy soil, Siltepec, No. 1719.

Achimenes saxicola (Brandeg.) Morton.—On wet ridge, Finca Juárez, No. 1765.

Corytholoma Warszewiczii (Bouché & Hanst.) Standl.—In sandy field, Cintalapa, Escuintla, No. 17401; in dry field, at 1200 m. alt., Mazapa, No. 4841. New to Mexican flora.

Drymonia chiapensis Brandeg.—On tree, in woods, Mt. Ovando, No. 4225.

Drymonia spectabilis (HBK.) Mart.—On tree, in forest, Cacaluta, Escuintla, Nos. 16572, 16510. Local name: "Viejito."

Episcia cupreata (Hook.) Hanst.—Cultivated, Escuintla, No. 16429. Local name: "Begonia."

Hypocryta nummularia Hanst.—On tree, on stream side, at 1900 m. alt., Mt. Pashtal, No. 1690.

Klugia azurea Schlecht.—On wet brook side, at 1700 m. alt., near Piedra Parada, Vol. Tacaná, No. 2433.

Kohleria Deppeana (S. & C.) Fritsch.—In open forest, at 1000 m. alt., Mt. Ovando, No. 6066; in open woods, San Luis, Siltepec, No. 5305.

Kohleria elegans (Done.) Loes.—Mostly on trees, in wet forest, Mt. Ovando, Nos. 695, 962, 1860, 3940; in wet forest, Rodeo, Siltepec, No. 1626.

Kohleria filispala Standl.—In sandy woods, Mt. Ovando (type locality), No. 574; on tree, in forest, Santa Rosa, near Escuintla, No. 4263.

Kohleria fruticosa Brandeg.—On tree, in forest, Mt. Ovando, No. 1828.

Kohleria longifolia (Lindl.) Hanst.—In open woods, Cacaluta, Acacoyagua, No. 16884.

Kohleria Skutchii Morton.—In edge of wet forest, Pinabeto, Motozintla, No. 5430.

Nautilocalyx inclinatus (Brandeg.) Morton.—In wet shade of woods, or forest, Esperanza, Escuintla, Nos. 628, 2601.

Phinaea parviflora (A. Br. & Bouch.)?—In wet shade of forest, Finca Juárez, Escuintla, No. 1764.

Solenophora Purpusii Brandeg.—In shaded ravine, Mt. Ovando, No. 3937; in wet ravine, on north slope, 1500 m. alt., Vol. Tacaná, No. 2832.

LENTIBULARIACEAE

Pinguicula moranensis HBK.—In pineland, wet ridge, at 3200 m. alt., Mt. Malé, No. 4708; on wet ridge, near Unión Juárez, south slope of Vol. Tacaná, No. 2779; on wet ridge, at 1700 m. alt., Frailesca, Siltepec, No. 5238.

ACANTHACEAE

Aphelandra Deppeana Schlecht. & Cham.—In wet woods, at the foot of Mt. Ovando, Nos. 151, 6162, 6198.

Aphelandra Schiedeana C. & S.—In wet forest, Mt. Ovando, No. 3955; in woods, Escobedo, Mapastepec, No. 18219.

Aphelandra speciosa Brandeg.—In open woods, at 1000 m. alt., Mt. Ovando, No. 6100; in wet forest, at 900 m. alt., Corcega, Pueblo Nuevo Comaltitlán, No. 17656; in wet forest, at 2000 m. alt., Frailesca, Siltepec, No. 5211.

Barleria micans Nees.—In dense thickets or bushes, Mt. Ovando, No. 159.

Blechum pyramidatum (Lam.) Urban.—In bushes, near beach, Las Garzas, Acapetahua, No. 2678.

Bravaisia integerrima (Speng.) Standl.—In open woods, at 1200 m. alt., Mt. Ovando, No. 16218.

Dyckhoriste ovata (Cav.) Kuntze.—In open mixed woods, Nuevo Amantenango, No. 4712.

Elytraria squamosa (Jacq.) Lindau.—In shaded woods, Mojarra, Tonalá, No. 17143; in shaded thickets, Esperanza, Escuintla, Nos. 17176, 17418.

Glockeria glabra Leonard.—In wet ravine, Mt. Pashtal, No. 1656.

Glockeria glandulosa Oerst.—On wet brook side, Santa Rita, Mapastepec, No. 1994.

Glockeria monolopha Donn. Sm.—In wet ravine, Mt. Ovando, No. 3969.

Habracanthus sylvaticus Nees.—In forest, at 1500 m. alt., Vol. Tacaná, No. 2485.

Hansteinia glandulosa (Oerst.) Linden.—In wet ravine, at 1800 m. alt., Mt. Ovando, No. 16249.

Henrya scorpioides Nees.—In thickets, at 1800 m. alt., Frailesca, Siltepec, No. 5216; in thickets, Escuintla, No. 133.

Jacobinia aurea (Schl.) Hemsl.—In wet edge of forest, Mt. Ovando, No. 2074; in forest, Escuintla, No. 161.

Jacobinia Purpusii Brandeg.—In advanced forest, Mt. Ovando, No. 4209.

Jacobinia umbrosa (Benth.) Blake.—In margin of forest, Haciendita, Siltepec, No. 1940; in wet woods, Barranca Honda, Siltepec, No. 4127; in wet woods, Esperanza, Escuintla, No. 17086. Local name: "Cresta de Gallo."

Justicia breviflora (Nee) Rusby.—In open woods, Pinada, Siltepec, No. 1910.

Justicia carthaginensis Jacq.—In thickets, near beach, Paredon, Tonalá, No. 16931.

Justicia comata (L.) Lam.—In woods, Escuintla, Nos. 2156, 17775; in thickets, Paredon, Tonalá, No. 16940.

Justicia inaequalis Benth.—In forest, Mt. Ovando, No. 3990.

Justicia soliana Standl.—In forest, Santa Rita, Mapastepec, No. 2011.

Mendoncia retusa Turrill.—In margin of forest, Esperanza, Escuintla, No. 16603, 17300. Local name: "Tapita."

Neohallia gorrerae Hemsl.—In wet forest, at 1500 m. alt., Vol. Tacaná, No. 2404.

Odontonema callistachyum (S. & C.) Kuntze.—In moist thickets, Mt. Ovando, No. 149; in wet woods, Acacoyagua, No. 17433.

Odontonema galbanum Leonard.—In wet forest, at 900 m. alt., Córcega, Pueblo Nuevo Comaltitlán, No. 17657; in wet woods, at 100 m. alt., Acacoyagua, Nos. 17434, 17629; in thickets, Cintalapa, Escuintla, No. 17430.

Odontonema glabra Brandeg.—In moist or dry thickets, Escuintla, No. 170; in thickets, at 1600 m. alt., Cascada, Siltepec, No. 5174.

Poikilacanthus macranthus Lindau.—In wet shaded woods, Mt. Ovando, No. 17726.

Pseuderanthemum atropurpureum (Bull) L. H. Bailey.—Cultivated in gardens, Escuintla, No. 17698. Local name: "Hoja de chile."

Pseuderanthemum cuspidatum (Nees) Radlk.—In bushes or thickets, Siltepec, No. 1606; in open thickets or woods, at 1200 m. alt., Mt. Ovando, No. 16269.

Ruellia Donnell-Smithii Leonard.—In forest edge, Mt. Ovando, No. 123.

Ruellia Hookeriana (Nees) Hemsl.—In roadside thickets, Acacoyagua, at 100 m. alt., No. 17394; in thickets, Siltepec, No. 1720.

Ruellia inundata HBK.—In thickets, near beach, Paredon, Tonalá, Nos. 16955, 17215, 17340.

Ruellia matagalpae Lindau.—In thickets, Escuintla, No. 158.

Ruellia Matudae Leonard, Contr. Univ. Mich. Herb. 6: 65. 1941.—In woods, Honduras, Siltepec, No. 4385; in dry thickets or woods, San Nicolás, Montecristo (type locality), No. 1966.

Ruellia megasphaera Lindau.—In open thickets, Mt. Ovando, No. 124.

Ruellia nudiflora (Engelm. & Gray) Urban.—In thickets, Paredon, Tonalá, No. 16965.

Ruellia paniculata L.—In thickets, near beach, Las Garzas, Acapetahua, No. 2675; in thickets, Paredon, Tonalá, No. 16281.

Sanchezia parvibracteata Sprague & Hutch.—On ridge, Escuintla, No. 128; cultivated, Acacoyagua, No. 17470. Local name: "Espina de Pescado."

Spathacanthus parviflorus Leonard.—In forest, Mt. Pashtal, No. 1696. New to Mexican flora.

PLANTAGINACEAE

Plantago floccosa Dcne.—In wet field, Siltepec, No. 690.

Plantago hirtella H.B.K.—In wet field, Siltepec, No. 1072; in field, Mt. Pashtal, Nos. 1076, 15029; on brook side, Palenque, Montecristo, No. 2007; in wet field, Mt. Ovando, Nos. 4163, 18187.

Plantago major L.—In wet field, Siltepec, No. 930.

RUBIACEAE

Alibertia edulis (L. Rich.) A. Rich.—In savanna field, Chicomuselo, No. 4446; in bushes near beach, Acapetahua, No. 2736; in bushes, Acacoyagua, No. 16678; in woods, Col. Soconusco, Acapetahua, No. 16527; in bushes, near beach, Mojarra, Tonalá, No. 17111. Local name: "Guayaba de Monte."

Anisomeris brachypoda (Donn. Sm.) Standl.—In wet forest, Mt. Ovando, Nos. 4174, 16404. Known from Guatemala, new to Mexican flora.

Borreria densiflora DC.—In wet field, Turquia, Escuintla, No. 17031; in field, near beach, Paredon, Tonalá, No. 16935.

Borreria Huanita (Llave & Lex) Hemsl.—In woods, or cultivated, near beach, Paredon, Tonalá, No. 16909. Local name: "Jasmin de Palo."

Borreria latifolia (Aubl.) Schum.—In field, Escuintla, No. 2142.

Borreria ocimoides (Burn.) DC.—In field, Esperanza, Escuintla, No. 2149.

Borreria suaveolens Meyr.—In dry field, at 600 m. alt., Chicomuselo, No. 18214.

Bouvardia bouvardioides Standl.—In margin of forest, Salina, Siltepec, Nos. 816, 1913; in woods, Mt. Ovando, No. 2298; in forest, Mt. Pashtal, Sierra Madre, No. 1000.

Bouvardia dictyonera Standl.—In pine woods, Mt. Ovando, Nos. 16267, 6127, 860, 2268, 2582, 4161, 17751; in open woods, Haciendita, Escuintla, No. 5990; in pine woods, at 300 m. alt., Mt. Malé, No. 18270; in woods, at 2500 m. alt., Mt. Boqueron, No. 18306; in cloud woods, at 2700 m. alt., Mt. Pashtal, Nos. 6111, 4247.

Bouvardia glabra Polak.—In forest, Vol. Tacaná, No. 2482.

Bouvardia induta (Robinson) Standl.—In pine woods, Nuevo Amatenango, No. 4801; in woods, Chicomuselo, No. 18271; in open woods, Honduras, Siltepec, Nos. 4374, 4398.

Bouvardia leiantha Benth.—In forest edge, north slope, Vol. Tacaná, No. 2305; in open woods, Barranca Honda, at 1600 m. alt., Siltepec, No. 18269.

Bouvardia Matudai Lundell, Lloydia 2: 105. 1939.—In advanced wet forest, Mt. Ovando (type locality), Nos. 2667, 3964.

Bouvardia pallida Standl.—In woods, at 2000 m. alt., Mt. Ovando, No. 16237.

Bouvardia quinquenervata Standl.—In pine woods, Mt. Ovando, No. 2069; in woods, San Luis, Siltepec, No. 5334; in open woods, at 2000 m. alt., La Granda, No. 18305.

Bouvardia venosissima Lundell, Bull. Torrey Club 66: 602. 1939.—In woods, Unión Juárez, No. 2748; in forest, at 2100 m. alt., north slope, Vol. Tacaná (type locality), No. 2954.

Calycophyllum candidissimum DC.—On stony ridge, Esperanza, Escuintla, No. 491; in open sandy woods, Santa Rosa, Tonalá, No. 17335. Local name: "Madron," "Palo colorado."

Chiococca alba (L.) Hitchc.—In woods, Nuevo Amatenango, No. 4790; in woods, Mojarra, Tonalá, No. 17213; in woods, at 1300 m. alt., Piñuela, Escuintla, No. 17573.

Chiococca filipes Lundell, Contr. Univ. Mich. Herb. 7: 53. 1942.—In woods, Nuevo Amatenango (type locality), No. 4783.

Chiococca phaenostemon Schlecht.—In woods, Cascada, Siltepec, No. 1721; in forest, north slope, Vol. Tacaná, No. 2447; in forest, La Granda, No. 5559.

Chomelia spinosa Jacq.—In woods, near beach, Belem, Mapastepec, No. 16746; in sandy woods, near beach, Mojarra, Tonalá, Nos. 17160, 17364.

Coffea arabica L.—Cultivated, without number.

Coffea bourbon.—Cultivated, No. 17453.

Coffea maragogipe.—Cultivated, No. 17478.

Coffea robusta.—Cultivated, No. 17469.

Coutarea hexandra (Jacq.) Schum.—On sandy river bank, Escuintla, No. 2744; on sandy river bank, Cacaluta, Escuintla, No. 16440; in woods, Mojarra, Tonalá, No. 17140. Local name: "Quina."

Crusea brachyphylla Cham. & Schl.—In pineland, at 1500 m. alt., Barranca Honda, Siltepec, No. 4105.

Crusea calocephala DC.—On open wet ground, Mt. Ovando, No. 2197; in wet field, Rancho Quemado, Acapetahua, No. 17392.

Crusea coccinea DC.—In thickets, Siltepec, No. 1703; in bushes, Mt. Ovando, No. 2574; in bushes, Finca Juárez, No. 1746; in thickets, Nuevo Amatenango, No. 4749; in waste grassy bushy area, Pico de Loro, Sierra Madre, No. 4271.

Crusea cruciata Wats.—In grassy field, Cascada, Siltepec, No. 1627.

Crusea parviflora Hook & Arn.—In sandy grassy field of Mojarra, Tonalá, No. 17231.

Crusea rubra Cham. & Schul.—In grassy field, at 1500 m. alt., Vol. Tacaná, No. 2467.

Deppea cornifolia Benth.—In woods, at 1900 m. alt., south slope, Vol. Tacaná, Nos. 2904, 2823.

Deppea grandiflora Schul.—In advanced wet forest, Mt. Ovando, Nos. 476, 500, 894, 1849; in open woods, San Luis, Siltepec, No. 5289; in woods, at 1900 m. alt., Frailesca, Siltepec, No. 5248.

Deppea inaequalis Standl. & Steyerl.—In mixed forest, at 1500 m. alt., Mt. Ovando, No. 17727.

Deppea tenuiflora Benth.—In woods, at 1500 m. alt., Mt. Ovando, No. 17763; in woods, at 2300 m. alt., Saxchanal, Sierra Madre, No. 4299.

Diodia rigida (Willd.) D. & S.—In bushes, Chicomuselo, No. 4479; in grassy thickets, Malpaso, Siltepec, No. 4514.

Duggena panamensis (Cav.) Standl.—In shaded bushes, Mt. Ovando, No. 132; in thickets, Escuintla, No. 2600; in thickets, Cacaluta, Acacoyagua, No. 16855. Distributed as "*Gonzalagunia panamensis* (Cav.) Schum."

Eizia mexicana Standl. Field Mus. Nat. Hist. 22: 50. 1940.—In grassy thickets, at 1600 m. alt., near Aguas Calientes, Vol. Tacaná (type locality), No. 2403.

Fareamea occidentalis (L.) Rich.—In forest, at 800 m. alt., Mt. Ovando, No. 4176; in forest, Jalapa, Escuintla, Nos. 646, 16503. Local name: "Hueso de Sapo."

Galium mexicanum H.B.K.—In wet open growth, Mt. Ovando, No. 2196.

Galium obovatum H.B.K.—In wet field, Siltepec, No. 1713.

Galium uncinulatum DC.—In wet field, Barranca Honda, Siltepec, No. 4064.

Genipa americana L.—In advanced forest, Mt. Ovando, No. 1560.

Genipa caruto H.B.K.—In woods, Malpaso, Siltepec, No. 4512; in woods, Escuintla, Nos. 5418, 10456; in woods, near beach, Belem, Mapastepec, No. 16744. Local name: "Maluco."

Genipa vulcanicola Standl.—In forest, Siltepec, No. 1633; in wet forest, Mt. Ovando, Nos. 433, 2081, 17732. Reported from Guatemala, new to Mexican flora.

Geophila herbacea (Jacq.) Schumann.—In shaded woods, Esperanza, Escuintla, No. 17297; in shaded woods, at 1900 m. alt., Mt. Ovando, No. 18238.

Gonzalagunia chiapensis (Standl.) Standl. & Steyerl.—In thickets, Vol. Tacaná, No. 2992; in bushes, Barranca Honda, Siltepec, No. 4039; in bushes, Cascada, Siltepec (type locality), No. 1064; in open bushes, San Luis, Siltepec, No. 5994. Distributed as *Rondeletia chiapensis*.

Gonzalagunia tacanensis Lundell, Lloydia 2: 106. 1939.—In second growth, Vol. Tacaná (type locality), No. 2462.

Guettarda macrosperma Donn. Sm.—In woods, Motozintla, No. 4866.

Hamelia longipes Standl.—In woods, Mt. Ovando, No. 4170; in thickets, Escuintla, Nos. 514, 640.

Hamelia nodosa Mart. & Gal.—In second growth, Esperanza, Escuintla, No. 16773.

Hamelia patens Jacq.—In bushes, Mt. Ovando, No. 4203; in secondary bushes, Escuintla, No. 653. Local name: "Cuasipinse"; in thickets, Mojarra, Tonalá, No. 17123.

Hillia Matudai Standl., Field Mus. Nat. Hist. 22: 51. 1940.—In woods, near Aguas Calientes, Vol. Tacaná (type locality), No. 2327; in forest, at 2580 m. alt., Pinabeto, Motozintla, No. 5472.

Hillia tetrandra Swartz.—Epiphytic on tree, in forest, at 1300 m. alt., Mt. Ovando, No. 17722.

Hoffmannia angustifolia Standl.—In wet woods, Letrero, Siltepec, No. 4354; in margin of forest, Vol. Tacaná, No. 2896; in forest, Mt. Ovando, Nos. 1826, 1961, 4214. Reported from Guatemala, new to Mexican flora.

Hoffmannia chiapensis Standl., Contr. U. S. Nat. Herb. 20: 206. 1919; Mus. Nat. Hist. 22: 283. 1940.—In forest, near Vol. Tacaná, No. 2450 (fr.); in forest, south slope near Chiquihuite, Vol. Tacaná, No. 2828.

Hoffmannia Conzattii Robinson.—In woods, Unión Juárez, No. 2801; in wet forest, west slope, Vol. Tacaná, No. 2902; in wet forest, Santa Isabel, Motozintla, No. 16407.

Hoffmannia cryptoneura Standl., Field Mus. Nat. Hist. 22: 23. 1940.—In forest, Mt. Ovando (type locality), Nos. 944, 955, 4159, 17733.

Hoffmannia excelsa (H.B.K.) Schum.—In wet shaded forest, Rodeo, Siltepec, No. 4561; in forest, at 2100 m. alt., north slope, Vol. Tacaná, No. 2984; in woods, at 1900 m. alt., Cascada, Siltepec, No. 15180; in forest, Mt. Boqueron, No. 5358.

Ixora coccinea L.—Cultivated commonly in garden, Esperanza, Escuintla, No. 16579.

Ixora Finlaysoniana Wall.—Cultivated, Escuintla, No. 16560. Local name: "Re-unión."

Lindenia rivalis Benth.—On river bank, Chicomuselo, No. 4449; on rock, in Desplado River, near Pueblo Nuevo Comaltitlán, No. 17654.

Mitracarpus hirtus (L.) DC.—In field Escuintla, No. 2214; in dry savanna field, at 600 m. alt., Chicomuselo, No. 18208.

Morinda asperula Standl.—In wet woods, Soconusco, Acapetahua, No. 16495. Reported from Guatemala, near to Mexican flora.

Nertera depressa Banks & Soland.—On rock, in wet forest, Siltepec, No. 384.

Palicourea crocea (Sw.) Roem. & Schult.—In woods, Belem, near beach, Mapastepec, No. 16740.

Palicourea Galeottiana Martens.—In woods, Mt. Ovando, No. 1831.

Palicourea mexicana (Willd.) Benth.—In wet woods, Boqueron, No. 15384; in woods, at 1300 m. alt., Mt. Ovando, No. 17723; in wet ravine, Cascada, Siltepec, No. 5093.

Palicourea Seleri Loes.—In wet forest, west slope, Vol. Tacaná, No. 2932; in forest, Saxchanal, No. 4291; in forest, Boqueron, Motozintla, No. 15379.

Pinarophyllon flavum Brandeg.—In wet grassy field, Finca Juárez, Escuintla, No. 1763; in wet margin of forest, Mt. Ovando, No. 4177; in wet thickets, Escuintla, Nos. 631, 16437.

Plocaniophyllon flavum Brandeg.—In wet forest, Mt. Ovando, Nos. 418, 1836, 4183.

Pogonopus speciosus (Jacq.) Schum.—In woods, Escuintla, Nos. 273, 560, 16811. New to Mexican flora.

Posoqueria latifolia (Lam.) R. & S.—In wet forest, Mt. Ovando, No. 2252; in forest, Cacaluta, Acacoyagua, No. 16869.

Psychotria altorum Standl. & Steyererm.—In forest, at 1500 m. alt., Mt. Ovando, No. 17762; in forest, at 2800 m. alt., western slope Vol. Tacaná, No. 2926. New to Mexican flora.

Psychotria carthaginensis Jacq.—In bushes, Mojarra, Tonalá, No. 17144.

Psychotria chiapensis Standl.—In forest, Mt. Ovando, No. 4178; in woods, Huicisil, Mt. Madre Vieja, No. 16729; in woods, Esperanza, Escuintla, No. 16396.

Psychotria cuspidata Brendem.—In thickets, Mt. Ovando, No. 665.

Psychotria flava Oerst.—In wet woods, La Grandeza, No. 5573.

Psychotria horizontalis Sw.—In open thickets, Mt. Ovando, No. 528; in open forest, Cacaluta, Escuintla, No. 16387.

Psychotria involucrata Sw.—In mixed woods, Mt. Ovando, Nos. 1819, 2542.

Psychotria macrophylla Ruiz & Pavón.—In mixed forest, at 1500 m. alt., Mt. Ovando, No. 6144.

Psychotria marginata Swartz.—In woods, Cacaluta, Escuintla, No. 16438.

Psychotria Oerstediana Standl.—In woods, Paredon, Tonalá, No. 16302.

Psychotria patens Sw.—In mixed dry forest, Mt. Ovando, Nos. 419, 682, 1820; in mixed forest, Mt. Madre Vieja, No. 2527.

Psychotria pubescens Sw.—In mixed forest, Mt. Madre Vieja, Nos. 649, 2525; in mixed woods, Haciendita, Escuintla, No. 5992.

Psychotria Skutchii Standl.—In mixed forest, at 2600 m. alt., Saxchanal, Sierra Madre, No. 4309. Known from Guatemala, new for Mexican flora.

Psychotria trichotoma Mart. & Gal.—In woods, Esperanza, Escuintla, No. 16461; in wet forest, Huicisil, near Mt. Madre Vieja, No. 16727. Local name: "Palo de agua."

Randia aculeata L.—In dry thickets, Mt. Ovando, No. 892; in woods, near beach, Paredon, Tonalá, No. 16913. Local name: "Crucecita."

Randia armata (Sw.) DC.—In mixed dry forest, Mt. Ovando, Nos. 516, 4161; in thickets, Escuintla, No. 2631; in thickets, Esperanza, Escuintla, No. 16551. Local name: "Crucecita," "Canastilla."

Randia cinerea (Fern.) Standl.—In woods, Paredon, Tonalá, No. 16314.

Randia Cookii Standl.—In woods, La Grandeza, No. 5574; in forest, Mt. Ovando, No. 17587.

Randia mitis L.—In sandy woods, Paredon, Tonalá, No. 16327. Local name: "Cuncucú."

Randia spinosa L.—In sandy woods, near beach, Santa Rosa, Tonalá, No. 17352.

Relbunum hypocarpium (L.) Hemsl.—In edge of forest, Mt. Pashtal, Nos. 1008, 6118; in wet shaded woods, at 2000 m. alt., Mt. Ovando, No. 18295.

Richardia scabra L.—In sandy field, Malpaso, Siltepec, No. 4516.

Rondeletia amoena (Pl.) Hemsl.—In open woods, Barranca Honda, Siltepec, Nos. 4028, 4036; in woods, Pinada, Siltepec, Nos. 1896, 15309; in cloud forest, at 2600 m. alt., Tres Cruces, Sierra Madre, No. 5030.

Rondeletia aprica Lundell, Contr. Univ. Mich. Herb. 7: 54. 1942.—In sunny wet woods, at 2500 m. alt., Saxchanal, Sierra Madre (type locality), No. 4314.

Rondeletia brachistantha Standl. & Steyererm.—In mixed forest, at 2000 m. alt., Mt. Ovando, No. 6125. Reported from Guatemala, new for Mexican flora.

Rondeletia buddleoides Benth.—In mixed forest, Mt. Pashtal, Nos. 1687, 17693; in woods, Mt. Ovando, Nos. 570, 861, 3999, 4012, 6146; in mixed forest, Siltepec, Nos. 387, 5226.

Rondeletia cordata Benth.—In forest, at 1800 m. alt., Mt. Ovando, No. 16226.

Rondeletia intermedia Hemsl.—In woods, Siltepec, No. 1590; in forest, Mt. Ovando, No. 2086; in open forest, Mt. Pashtal, Nos. 396, 521.

Rondeletia laniflora Benth.—In open forest, Libertad Calera, Motozintla, No. 15509;

in open woods, Mt. Pashtal, Nos. 400, 463, 17686; in wet forest, Vol. Tacaná, No. 2929; in mixed forest, at 1300 m. alt., Mt. Ovando, No. 10930; in wet cloud forest, at 2300 m. alt., Frailesca, Siltepec, Nos. 15270, 5292.

Rondeletia leucophylla HBK.—Cultivated, Escuintla, No. 16434. Local name: "Mimosa."

Rondeletia nitida Hemsl.—In mixed forest, Letrero, Siltepec, No. 4328.

Rondeletia longiflora Benth.—In forest, Mt. Ovando, No. 1848.

Rondeletia myriantha Standl. & Steyerl.—At 1200 m. alt., in wet forest, south slope of Mt. Ovando, No. 6067. New to Mexican flora.

Rondeletia septicidalis Rob.—In mixed forest, at 2100 m. alt., north slope, Vol. Tacaná, No. 2965.

Rondeletia suffrutescens Brandeg.—In wet forest, Vol. Tacaná, Nos. 2439, 18183; in woods, Siltepec, No. 1675; in forest, Mt. Ovando, No. 3998.

Rondeletia strigosa (Benth.) Hemsl.—In open forest, Siltepec, No. 1705; in mixed forest, Mt. Ovando, Nos. 2566, 4152.

Rondeletia tacanensis Lundell, Bull. Torrey Club 66: 603. 1939.—In mixed forest, at 2000 m. alt., Vol. Tacaná (type locality), No. 2396 (Fr.); in mixed woods, at 2500 m. alt., Boqueron, Motozintla, No. 5372.

Rudgea ceratopetala Donn. Sm.—In wet forest, Mt. Ovando, No. 3992; in mixed woods, Escuintla, No. 904.

Rudgea cornifolia (H. & B.) Standl.—In woods, Col. Cacao, Escuintla, No. 16597; in shady edge of forest, Jiuguero, Escuintla, No. 16578.

Sickingia rhodoclada (Standl.) Standl.—In wet forest, Cacaluta, Escuintla, Nos. 16449 (fl.), 16805 (fr.); in woods, at 700 m. alt., Piñuela, Escuintla, No. 17577. Local name: "Pie de Pava."

CAPRIFOLIACEAE

Sambucus mexicana Presl.—In wet field, Laguna, San Luis, Montecristo, No. 1935, often cultivated. Local name: "Sauco."

Viburnum blandum Morton.—In mixed forest, Mt. Ovando, Nos. 431, 2662.

Viburnum chiapense Lundell, Bull. Torrey Club 66: 603. 1939.—In wet forest, at 2600 m. alt., Vol. Tacaná, No. 2925.

Viburnum guatemalense Gandoger.—In open woods, Barranca Honda, Siltepec, Nos. 4054, 5129, 4056; Mt. Pashtal, No. 1001; in forest, Vol. Tacaná, No. 2460; in mixed forest, Mt. Ovando, Nos. 2556, 16052; in forest, Boqueron, Motozintla, No. 5382.

Viburnum Hartwegi Benth.—In woods, Mt. Ovando, No. 425; in wet forest, Santa Isabel, Motozintla, No. 16408.

Viburnum Matudae Morton, Proc. Biol. Soc. Wash. 51: 215. 1938.—In woods, Ventanas, Siltepec, No. 4548; in wet forest, Siltepec (type locality), No. 1587.

Viburnum montanum Lundell, Lloydia 2: 106. 1939.—In mixed forest, Mt. Ovando (type locality), Nos. 2564, 3962.

Viburnum optatum Morton.—In forest, Saxchanal, Sierra Madre, No. 4290.

Viburnum optatum var. *vagon* Morton.—In woods, Mt. Pashtal, No. 401.

Viburnum tacanensis Lundell, Lloydia 2: 107. 1939.—In forest, at 2500 m. alt., north slope, Vol. Tacaná (type locality), No. 2332.

VALERIANACEAE

Valeriana aplifolia Gray.—In edge of forest, at 1000-1200 m. alt., Vol. Tacaná, No. 2492.

Valeriana Candolleana Barden.—In woods, Mt. Pashtal, Sierra Madre, No. 1071; in woods, at 2000 m. alt., Frailesca, Siltepec, No. 5209; in woods, at 1700 m. alt., Letrero, Siltepec, No. 18307.

Valeriana cacalioides Standl. Field Mus. Nat. Hist. 22: 125. 1940.—On rock, Mt. Ovando (type locality), No. 1812.

Valeriana cucurbitifolia Standl. Field Mus. Nat. Hist. 22: 58. 1940.—On rocks, Mt. Ovando, Nos. 2572, 4204; on rocky ridge, Tabla, Siltepec (type locality), No. 1709; on calcareous rock, Mt. Malé, No. 4602; on wet ridge, at 1950 m. alt., Haciendita, 50 km. northeast of Escuintla, No. 5087.

Valeriana densifolia Benth.—On open pine ridge, Mt. Malé, No. 4691.

Valeriana scandens L.—In woods, Siltepec, No. 929.

Valeriana scorpioides DC.—On open grassy ridge, Barranca Honda, Siltepec, No. 4106; in pine woods, Mt. Ovando, 2187; in open field, north slope, Vol. Tacaná, No. 2491.

Valeriana Skutchii Standl.—In pine woods, at 3000 m. alt., Mt. Malé, No. 4638.

Valeriana sorbifolia H.B.K.—In open grassy field, Siltepec, No. 804; in open field, Barranca Honda, Siltepec, No. 4133.

Valeriana subincisa Benth.—In grassy field, at 2800 m. alt., western slope, Vol. Tacaná, No. 2892.

CUCURBITACEAE

Abzolia composita (Donn. Sm.) Standl. & Steyerl.—In thickets, Escuintla, Nos. 2151, 17047. Local name: "Huisquil de Caballo." Reported from Guatemala, new to Mexican flora.

Cayaponia attenuata (Hook & Arn.) Cogn.—In bushes, near beach, Mojarra, Tonalá, No. 17191.

Cayaponia dubia (H. & A.) Rose.—In woods, Paredon, Tonalá, No. 16939.

Cayaponia microdanta Blake.—In thickets, Corosal, 16 km. west of Acacoyagua, No. 17507.

Cayaponia racemosa (Sw.) Cogn.—In thickets or bushes, Esperanza, Escuintla, No. 2172; in wet bushy area, Mojarra, Tonalá, No. 17188. Local name: "Mata Piojo."

Cucurbita Pepo L.—In thickets, Esperanza, Escuintla, No. 16556. Local name: "Calabaza de Caballo."

Cyclanthera Langaei Cogn.—In woods, Esperanza, Escuintla, No. 17298.

Cyclanthera pedata Schrad.—In open woods, Pinabeto, No. 5460.

Echinocystis Coulteri Cogn.—In bushes, Cascada, Siltepec, No. 2255; in second growth, at about 1000 m. alt., Mt. Ovando, No. 6082.

Elaterium ciliatum Cogn.—On sandy river bank, Aguas Calientes, Escuintla, No. 16629.

Luffa operculata (L.) Cogn.—In thickets, near beach, Las Garzas, Acapetahua, No. 2680; in bushes, Santa Elena, Acapetahua, Nos. 17254, 17186. Local name: "Esponjera."

Momordica charantia L.—Cultivated, often escaped, Esperanza, Escuintla, No. 16722. Local name: "Conde Amor."

Pittieria grandiflora Cogn.—In woods, Acacoyagua, No. 17508.

Pittieria longipedunculata Cogn.—In thickets, Escuintla, No. 2125.

Pittieria trilobata Cogn.—In thickets, Esperanza, Escuintla, No. 16562.

Sicydium glabrum Standl. & Steyerl.—In woods, Boqueron, Motozintla, No. 5349; in thickets, Col. Soconusco, Acapetahua, Nos. 16549, 16570; in wet woods, at 2000 m. alt., north slope of Vol. Tacaná, No. 18220. Reported from Guatemala, new to Mexican flora.

Sicydium Schiedeianum Schl. & Cham.—In thickets, Escuintla, No. 2628.

Sicydium tamnifolium (H.B.K.) Cogn.—In thickets, Escuintla, No. 519.

CAMPANULACEAE

Centropogon grandidentatus (Schl.) In woods, at 2800 m. alt., western slope, Vol. Tacaná, No. 2900.

Centropogon cordifolius Benth.—In forest, at 3000 m. alt., Vol. Tacaná, No. 2311; in open woods, at 2585 m. alt., Pinabeto, Motozintla, No. 5471.

Diatatea micrantha (HBK.) McVaugh.—In wet open woods, Mt. Ovando, No. 6030.

Heterotoma lobelioles Zucc.—On grassy ridge, at 2700 m. alt., Vol. Tacaná, No. 2989; in open grassy field, Buena Vista, Acacoyagua, No. 1877; in pine woods, San Luis, at 1500 m. alt., Siltepec, No. 532.

Isotoma longiflora (L.) Presl.—In wet grassy field, San Vicente, Tacaná, No. 2513.

Lobelia aguana Wimmer.—In wet margin of woods, at 2500 m. alt., western slope, Vol. Tacaná, No. 2693. Known from Guatemala, new to Mexican flora.

Lobelia Berlandieri A. DC.—In grassy pine woods, Mt. Malé, No. 4587.

Lobelia cardinalis L.—In wet grassy land, at 600 m. alt., Chicomuselo, No. 18210; in wet field, Rancho Quemado, Acapetahua, No. 17387.

Lobelia fasciculata Donn. Sm.—In grassy pine woods, at 3500 m. alt., Vol. Tacaná, No. 2339. Local name: "Violeta."

Lobelia laxiflora H.B.K.—In open thickets, Mt. Ovando, Nos. 127, 958, 16234; in pine woods, at 1500 m. alt., San Luis, Siltepec, No. 5322.

Lobelia plebeia E. Wimmer.—In edge of wet forest, Mt. Ovando, No. 474.

Lobelia stenodonta (Fervn.) McVaugh.—In woods, Siltepec, No. 996; in wet thickets, Mt. Pashtal, No. 1868.

Lobelia urticifolia Wimmer.—In pine woods, Mt. Malé, No. 4584.

Lobelia xalapensis H.B.K.—In open grassy field, Siltepec, No. 2253.

COMPOSITAE

Achillea millefolium L.—In wet field, Pinabeto, No. 5422; in wet field, at 2800 m. alt., Vol. Tacaná, No. 2834.

Ageratum corymbosum Zuccag.—In sandy sunny thickets, Motozintla, No. 4867.

Ageratum Houstonianum Mill.—In wet field, Esperanza, Escuintla, Nos. 6101, 16841. Local name: "Borraja."

Ageratum rugosum Coult.—In open field, Mt. Ovando, No. 717.

Ageratum tomentosum (Benth.) Hemsl.—In open woods, Mt. Ovando, No. 3968; in grassy pine woods, Vol. Tacaná, Nos. 2493, 2548.

Alomia Wendlandia (Sch. Bip.) Robinson.—In open field, at 1000 m. alt., Mt. Ovando, No. 6070.

Aplopappus stoloniferus DC.—In open woods, at 4000 m. alt., Vol. Tacaná, No. 2347; in stony grassland, at 3200 m. alt., Mt. Malé, No. 4621.

Archibaccharis asperifolia (Benth.) Blake.—In open woods, at 1800 m. alt., Mt. Ovando, Nos. 16251, 4011.

Archibaccharis flexilis Blake.—In moist thickets, Mt. Ovando, Nos. 711, 16235.

Archibaccharis hirtella var. *taeniotricha* Blake.—In second growth, Mt. Ovando, No. 2639.

Archibaccharis mucronata var. *paniculata* (Donn. Sm.) Blake.—In open woods, at 1100 m. alt., Mt. Ovando, No. 16236.

Archibaccharis serratifolia var. *paniculata* (Donn. Sm.) Blake.—In woods, Mt. Pashtal, Sierra Madre, No. 744.

Archibaccharis sescenticeps Blake.—In thickets, Mt. Ovando, No. 706.

Archibaccharis subsessilis Blake.—In woods, Mt. Pashtal, Sierra Madre, No. 741.

- Archibaccharis Standleyi* var. *aequivencia* Blake.—In secondary thickets, Mt. Ovando, No. 700.
- Archibaccharis torquis* Blake.—In open mixed woods, Mt. Pashtal, Sierra Madre, No. 1544; in second growth, Ojo de Agua, at the foot of Mt. Pashtal, No. 786.
- Baccharis glutinosa* Pers.—In sunny thickets, Mt. Ovando, Nos. 714, 725, 1020; in thickets, Mazapa, No. 4875; in sandy field, Santa Elena, Acapetahua, Nos. 16749, 17417. Local name: "Chilca."
- Baccharis trinervis* (Lam.) Pers.—In second growth, Letrero, Siltepec, Nos. 4340, 5052.
- Baccharis vaccinioides* H.B.K.—In open woods, Mt. Pashtal, Sierra Madre, No. 722; in second growth, Vol. Tacaná, No. 2825; in woods, at 1600 m. alt., Cascada, Siltepec, No. 5107.
- Bidens aurea* (Ait.) Sherff.—In grassy field, Amatenango del Valle, No. 15892.
- Bidens ostruthioides* (DC.) Schz. Bip.—In open sunny thickets, Siltepec, No. 795; in grassy pine woods, Mt. Malé, No. 4620.
- Bidens ostruthioides* var. *costaricensis* (Benth.) Sherff.—In pine woods, at 3000 m. alt., Vol. Tacaná, No. 2317.
- Bidens squarrosa* H.B.K.—In margin of forest, Mt. Pashtal, Sierra Madre, No. 748; in edge of woods, Mt. Ovando, Nos. 704, 3932, 6150.
- Brickellia adepocarpa* Robinson.—In field, Cascada, at 1300 m. alt., Siltepec, No. 5127.
- Brickellia diffusa* (Vahl) Gray.—In sandy thickets, Escuintla, No. 788.
- Calypocarpus vialis* Less.—In grassy pine woods, Mt. Pashtal, No. 738.
- Calea guatemalensis* J. D. Sm.—In pine woods, Mt. Malé, No. 4685.
- Calea integrifolia* Hemsl.—In open field, Siltepec, No. 852; in open woods, Pinada, Siltepec, No. 2003.
- Calea peduncularis* H.B.K.—In open grassy woods, Nuevo Amatenango, No. 4745.
- Calea scabra* (Lag.) Robinson.—In open woods, at 1600 m. alt., Cascada, Siltepec, No. 5069.
- Calea Skutchii* Blake.—In pine woods, Mt. Malé, No. 4627; in woods, at 2500 m. alt., Pinabeto, Motozintla, No. 5454. Known from Guatemala, new to Mexican flora.
- Calea Standleyi* Steyererm.—In forest, at 2800 m. alt., western slope, Vol. Tacaná, No. 2930. New to Mexican flora.
- Chaptalia nutans* (L.) Polak.—In grassy pine woods, Mt. Malé, Nos. 4686, 18302; in grassy field, San Vicente near Tapachula, No. 2516.
- Chrysanthemum parthenium* (L.) Pers.—In field, at 1900 m. alt., Mt. Ovando, No. 776; mostly cultivated; in Frailesca, Siltepec, No. 5221. Local name: "Altamisa."
- Circium guatemalense* Blake.—In pine woods, at 3000 m. alt., Vol. Tacaná, No. 2302; in pine woods, at 3200 m. alt., Mt. Malé, No. 4599.
- Circium mexicanum* DC.—In pine woods, Nuevo Amatenango, No. 4717; in field, at 1600 m. alt., Frailesca, Siltepec, No. 5218.
- Circium subcoriaceum* (Less.) Petrak.—In cloud pine woods, at 2600 m. alt., Tres Cruces, Sierra Madre, No. 5038; in uncultivated field, south slope near Chiquihuite, Vol. Tacaná, No. 2847; in pine woods, at 1500 m. alt., Mt. Ovando, No. 18275; in pine woods, San Luis, Siltepec, No. 5293.
- Clibadium arboreum* J. D. Sm.—In second growth, at 1500 m. alt., Vol. Tacaná, No. 2422.
- Clibadium oligandrum* Blake.—In sunny grassy second growth, Barranca Honda, Siltepec, No. 4059; in second growth, near Unión Juárez, south slope, Vol. Tacaná, No. 2754.
- Clibadium villosum* Benth.—In thickets, north slope near Piedras Paradas, Vol. Tacaná, No. 2413.

Conyza bonariensis (L.) Cronquist.—In grassy field, Nandolopez, Acapetahua, No. 16659.

Conyza canadensis (L.) Cronquist.—In grassy field, Nandolopez, Acapetahua, No. 16660; in thickets, Turquia, Escuintla, No. 16848.

Conyza chilensis Spreng.—In pineland at 1200 m. alt., Nuevo Amatenango, No. 18209.

Conyza coronopifolia H.B.K.—In second growth, Siltepec, No. 4679.

Conyza lyrata HBK.—In waste field, Paredon, Tonalá, No. 16358.

Coreopsis mutica DC.—In woods, at 2000 m. alt., Mt. Ovando, Nos. 2595, 16995.

Cosmos caudatus HBK.—Cultivated, often escaped, Acacoyagua, Nos. 16602, 17496. Local name: "Cambray."

Cosmos crithmidolius H.B.K.—In open woods, Nuevo Amatenango, No. 4776.

Dahlia excelsa Benth.—In thickets, at 2000 m. alt., Mt. Ovando, No. 2233.

Dahlia pinnata Cav.—In thickets, Miramar, 48 km. east of Escuintla, at 1600 m. alt., No. 785; in wet field, at 2580 m. alt., Pinabeto, No. 15452.

Delilia biflora (L.) Kuntze.—In woods, at 1200 m. alt., Mt. Ovando, No. 6065.

Desmanthodum caudatum Blake, Jour. Wash. Acad. Sci. 28: 479. 1938.—In woods, Finca Juárez near Escuintla (type locality), Nos. 1750, 1756.

Desmanthodum tomentosum Brandeg.—In second growth, San Vicente, near Tapachula, No. 2508.

Eclipta alba (L.) Hassk.—In field, near beach, Las Garza, Acapetahua, No. 18248; in field, Cacaluta, Acacoyagua, No. 17020.

Egletes viscosa (L.) Less.—In sandy field, Paredon, Tonalá, No. 16276; in thickets, Mapastepec, No. 17518.

Elvira biflora (L.) Cass.—In woods, Nuev Amatenango, No. 4779.

Erechtites agrestis (Sw.) Standl. & Steyerl.—In wet field, Nandolopez, Acapetahua, No. 16647; in uncultivated field, Mt. Ovando, at 1200 m. alt., No. 6169. Reported from Guatemala, new to Mexican flora.

Erechtites hieracifolia DC.—In savanna woods, Chicomuselo, No. 4457.

Erechtites valerianaeifolia (Walf.) DC.—In open thickets, Pinada, Siltepec, No. 1971; in pine woods, at 3000 m. alt., Vol. Tacaná, No. 2451; in woods, at 1500 m. alt., San Luis, Siltepec, No. 5303; in open woods, at 1200 m. alt., Mt. Ovando, No. 6199.

Erigeron bonariensis L.—In open thickets, at 1000 m. alt., Vol. Tacaná, No. 2443; sunny waste soil, Mt. Ovando, No. 760.

Erigeron canadensis L.—In grassy field, Siltepec, No. 765.

Erigeron Karwinskianus DC.—In stony field, at 2000 m. alt., north slope, Vol. Tacaná, No. 2953; on moist rock, Mt. Ovando, No. 1029; in open wet field, Siltepec, at 1700 m. alt., No. 18258; in pine woods, at 2600 m. alt., Mt. Pashtal, Nos. 17671, 5108.

Erigeron pusillus Nutt.—In second growth, at 1500 m. alt., north slope, Vol. Tacaná, No. 2498.

Espejoa mexicana DC.—In dry field, near beach, Paredon, Tonalá, No. 17027.

Eupatoriastrium Nelsonii Robinson.—In sandy thickets, Jilguero, Escuintla, No. 16444. Local name: "Barbona."

Eupatoriastrium Nelsonii var. *cardiophyllum* R. & G.—In sandy thickets, Jilguero, Escuintla, No. 2134. Local name: "Ruibarvo."

Eupatoriastrium opadoclinium Blake Journ. Wash. Acad. Sci. 28: 489: 1938.—In pine woods, Mt. Ovando (type locality), No. 702; in pine woods, Pinada, Siltepec, No. 1951.

Eupatrium angulifolium Rob.—In sandy woods, Mt. Ovando, Nos. 726, 3948, 6200. Local name: "Ruibarvo."

Eupatrium aralaefolium Leas.—In woods, at about 2000 m. alt., western slope, Vol. Tacaná, No. 2897.

Eupatorium areolare DC. In open woods, Siltepec, No. 856; in pine woods, Mt. Ovando, No. 1546.

Eupatorium collinum DC.—In open woods, at 1200 m. alt., Mt. Ovando, No. 6149; in thickets, Siltepec, No. 1554; in thickets, Col. Hidalgo, Acacoyagua, No. 16365. Local name: "Hierba de Chucho."

Eupatorium Heydeanum Robinson.—In edge of forest, Mt. Ovando, No. 2656.

Eupatorium hospitale Rob.—In open woods, Mt. Ovando, Nos. 735, 1028; in woods, Siltepec, No. 850; in woods, at 2000 m. alt., north slope, Vol. Tacaná, No. 2480; in open forest, at 2800 m. alt., near Chiquihuite, south slope, Vol. Tacaná, No. 2822; in forest, Letrero, Siltepec, Nos. 4334, 5154.

Eupatorium leucocephalum Benth.—In open woods, Mt. Ovando, No. 2652; in woods, Mt. Pashtal, No. 745; in open woods, Siltepec, Nos. 796, 5121; in forest, north slope, Vol. Tacaná, No. 2944; in woods, Cacaluta, Acacoyagua, No. 17554.

Eupatorium ligustrinum DC.—In open woods, Mt. Malé, No. 4613; in open woods, Mt. Pashtal, No. 740; in woods, north slope, Vol. Tacaná, No. 2307; in forest, Siltepec, No. 1669.

Eupatorium macrophyllum L.—In thickets, Escuintla, No. 724.

Eupatorium mairetianum DC.—In woods, Mt. Pashtal, Sierra Madre, No. 1651.

Eupatorium morifolium Mill.—In wet field, Siltepec, at 1700 m. alt., Nos. 5165, 18257; in thickets, at 150 m. alt., Esperanza, Escuintla, No. 17457.

Eupatorium Oerstedianum Benth.—In open woods, at 2000 m. alt., Mt. Pashtal, No. 737.

Eupatorium odoratum L.—In pine woods, Mt. Ovando, No. 777; in thickets, near beach, Mojarra, Tonalá, No. 17156.

Eupatorium pansamalense Rob.—In woods, north slope, Vol. Tacaná, No. 2412.

Eupatorium Pittieri Klatt.—In edge of woods, Siltepec, No. 1542; in woods, Mt. Ovando, Nos. 4010, 6177.

Eupatorium pycnocephalum Less.—In sunny forest edge, Mt. Ovando, No. 862; in open thickets, at 1500 m. alt., Vol. Tacaná, No. 2481; in woods, Siltepec, Nos. 1551, 5308.

Eupatorium quadrangulare DC.—In open thickets, Escuintla, No. 781.

Eupatorium Sinclairii Benth.—In woods, at 1000 m. alt., south slope, Mt. Ovando, No. 6140.

Eupatorium solidaginoides H.B.K.—In grassy woods, Siltepec, No. 1555.

Eupatorium Schultzii Schnittspahn.—In grassy woods, Mt. Ovando, Nos. 727, 774; in open thickets, Mt. Pashtal, No. 732; in open woods, Siltepec, No. 799.

Eupatorium Skutchii Rob.—In woods, at 2100 m. alt., north slope, Mt. Tacaná, No. 2996.

Eupatorium Tuerckheimii Klatt.—In pine woods, Pinada, Siltepec, No. 1937; in pine woods, Mt. Ovando, No. 16225.

Galeana pratensis (L. & L.) Rydb.—In savanna thickets, Chicomuselo, No. 4483.

Galinsoga ciliata (Raf.) Blake.—In wet field, Cascada, Siltepec, No. 5132.

Gnaphalium americanum Mill.—In open woods, at 2300 m. alt., Tres Cruces, Sierra Madre, No. 5043.

Gnaphalium attenuatum DC.—In open thickets of second growth, Barranca Honda, Siltepec, No. 4065; in pine woods, Mt. Pashtal, No. 712.

Gnaphalium leptophyllum DC.—In open woods, Mt. Ovando, No. 784; in open woods, Siltepec, No. 4680.

Gnaphalium oxyphyllum DC.—In grassy field, at 2100 m. alt., north slope, Vol. Tacaná, No. 2950.

Gnaphalium oxyphyllum var. *semilanatum* DC.—In open thickets, Mt. Ovando, No. 703.

Gnaphalium salitifolium (Bertol) Sch. Bip.—In volcanic stony thickets, at 4000 m. alt., Vol. Tacaná, No. 2872.

Gnaphalium semiamplexicaule DC.—In grassy pine woods, at 2000 m. alt., Mt. Ovando, No. 3952; in edge of open woods, Buena Vista, Acacoyagua, No. 1956; in field, Piabeto, Motozintla, No. 5451.

Gomphrena dispersa Standl.—In thickets, near La Bonanza, Acapetahua, No. 16778. Local name: "Sanguinaria."

Gomphrena nana (Stuhl.) Standl.—In grassy field, Mojarra, Tonalá, Nos. 17208, 16910; in sunny field, Turquia, Escuintla, No. 17036.

Gomphrena Palmerii Standl.—In sandy thickets, Escuintla, No. 2160.

Gymnocoronis latifolia Hook. & Arn.—On brook side, Las Garzas, Acapetahua, No. 2686.

Hemibaccharis Standleyi var. *aequivenia* Blake.—In second growth Mt. Ovando, No. 4005.

Hieracium abscissum Less.—In open woods, Vol. Tacaná, No. 2362; in pine woods, Mt. Malé, No. 4615; in thickets, Saxchanal, No. 4304.

Hieracium comatum Fries.—In woods, Mt. Pashtal, No. 1693.

Hieracium culminicola Standl. & Steyerl.—On wet ridge, Ventana, Siltepec, No. 18244. Reported from Guatemala, new to Mexican flora.

Hieracium Selerianum Zahn.—In thickets, Cacaluta, Escuintla, No. 16996; in field, at 1700 m. alt., Siltepec, No. 806; in open woods, at 1700 m. alt., Mt. Ovando, No. 761.

Hymenostephium cordatum (H. & A.) Blake.—In pine woods, Mt. Ovando, Nos. 708, 3958.

Isocarpha divaricata Benth.—In grassy thickets, near beach, Las Garzas, Acapetahua, No. 2705.

Jaegeria hirta (Lag.) Less.—In second growth, at 1000 m. alt., north slope, Tacaná, No. 2472.

Lagascia helianthifolia var. *suaveolense* (H.B.K.) Rob.—In pineland, Montecristo, No. 1961; in pine woods, Mt. Pashtal, Sierra Madre, No. 791.

Liabum Andrieuxii (DC.) B. & H.—In second growth, Barranca Honda, Siltepec, No. 4108.

Liabum Bourgeaui Hieron.—On wet brook side, south slope near Unión Juárez, Vol. Tacaná, No. 2746; in riverside wet thickets, north slope near Aguas Calientes, Vol. Tacaná, No. 2331.

Liabum discolor (H. & A.) B. & H.—In forest, Pinada, Siltepec, No. 1879.

Liabum glabrum var. *hypoleucum* Greenm.—In wet forest, Siltepec, No. 805; in wet ravine, at 1100 m. alt., Mt. Ovando, No. 16211.

Melanthera aspera (Jacq.) Steud.—In grassy field, Siltepec, No. 766.

Melanthera nivea (L.) Small.—In field, Escuintla, No. 715; in secondary thickets, Acacoyagua, No. 17619.

Melampodium divaricatum (Rich.) DC.—In field, north slope near Aguas Calientes, Vol. Tacaná, No. 2459.

Melampodium linearilobum DC.—In savanna thickets, Chicomuselo, Nos. 4444, 4504.

Mikania cordifolia (L.) Willd.—In edge of forest, Mt. Ovando, Nos. 1019, 16204; in thickets, Escuintla, No. 17385.

Mikania eriophora Sch. Bip.—In wet forest, Barranca Honda, Siltepec, No. 4025.

Mikania globosa Coul.—In wet woods, Mt. Ovando, No. 4149.

Mikania Houstoniana (L.) Rob.—In wet forest, at 2700 m. alt., west slope, Vol. Tacaná, No. 2898.

Mikania micrantha H.B.K.—In sunny thickets, Mt. Ovando, No. 759; in thickets, Mojarra, Tonalá, No. 17110; Las Garzas, Acapetahua, No. 2704.

Mikania pyramidata Donn. Smith.—In wet forest, at 1700 m. alt., Barranca Honda, Siltepec, No. 4025.

Mikania pterocaula Schultz Bip.—In open woods, Boqueron, Motozintla, No. 15356.

Mikania tacanensis Standl. & Steyerl.—In open woods, at 2100 m. alt., Vol. Tacaná, No. 2986. Reported from Guatemala, new to Mexican flora.

Mikania vitifolia DC.—In open thickets, Esperanza, Escuintla, No. 17384.

Milleria quinqueflora L.—In thickets, Paredon, Tonalá, No. 16921. Local name: "Chinchisque."

Montanoa frutescens (M.) Hemsl.—In open thickets, Barranca Honda, Siltepec, No. 4120; in open thickets, Mt. Ovando, No. 2235.

Montanoa hibiscifolia Benth.—In gassy thickets, Acacoyagua, No. 723.

Montanoa myriocephala Rob. et. G.—In bushes, at 1000 m. alt., Las Cadenas, Acacoyagua, No. 1889; in open woods, Mt. Ovando, No. 16247.

Neurolaena lobata (L.) R. Br.—In sunny thickets, Esperanza, Escuintla, Nos. 2605, 17530; in second growth, Mt. Ovando, No. 1850. Local name: "Arnica."

Notoptera brevipes (Rob.) Blake.—In open field, Siltepec, No. 809; in pine woods, Pinada, Siltepec, No. 1907.

Onoseris onoseroides (HBK.) Robinson.—On dry ridge, Piñuela, 25 km. northeast of Escuintla, No. 5000.

Onoseris rupestris (Benth.) Greenm.—On sunny ridge, Mt. Ovando, No. 16242.

Otopappus trinervis Blake.—In pine woods, Mt. Pashtal, Sierra Madre, No. 1655.

Otopappus verbesinoides Benth.—In open woods, Siltepec, No. 863.

Oxylobus glanduliferus (Sch. Bip.) Gray.—In Cypress woods, at 3500 m. alt., north slope, Vol. Tacaná, No. 2320.

Parthenium Hysterophorus L.—On road side, Tapachula, No. 17703.

Pectis arenaria Benth.—In sandy field, near beach, Las Garzas, Acapetahua, No. 2714; in sandy field, Paredon, Tonalá, No. 16309.

Pectis Bonplandiana H.B.K.—In savanna grassy field, Chicomuselo, No. 4461.

Pectis satureioides (Mill.) Sch. Bip.—In savanna, near beach, Belem, Mapastepec, No. 17597.

Perymenium buphtalmoides DC.—In pineland, Montecristo, No. 5930.

Perymenium discolor Schrad.—In open field, Mt. Ovando, No. 783.

Perymenium Purpusii Brandeg.—In open thickets, at 2000 m. alt., north slope, Vol. Tacaná, No. 2455.

Perymenium strillosum Greenm.—In open thickets, Siltepec, No. 1663.

Pinaropappus caespitosus Brandeg.—In open woods, Amatenango, No. 18245.

Pinaropappus roseus Less.—In pine woods, at 3200 m. alt., Mt. Malé, No. 4624.

Pluchea purpurascens (Swartz) DC.—In thickets, Paredon, Tonalá, No. 16278.

Podchaenium eminens (Lag.) Sch. Bip.—In secondary thickets, near Aguas Calientes, north slope, Vol. Tacaná, No. 2956; in thickets, San Luis, Siltepec, No. 5313; in field, Esperanza, Escuintla, No. 6104.

Polymnia maculata Cav.—In open thickets, Siltepec, No. 764; along railway, near Acacoyagua, No. 17527.

Rensonia salvadorica Blake.—In open thickets, Esperanza, Escuintla, Nos. 719, 16548; in open field, Mt. Pashtal, Sierra Madre, No. 750.

Rojasianthe superba Standl. & Steyerl.—In edge of forest, near Chiquihuite, south slope, Vol. Tacaná, No. 2860. Known from Guatemala, new to Mexican flora.

Rumfordia media Blake. Jour. Wash. Acad. Sci. 28: 490. 1938.—In open thickets, Mt. Ovando (type locality), Nos. 710, 16256.

Salmea scandens (L.) DC.—In forest, Siltepec, No. 1548; in field, at 1600 m. alt., Cascada, Siltepec, No. 5099.

Schistocarpha Kellermanii Rydb.—In open thickets, Mt. Ovando, No. 709.

Schistocarpha longiligula Rydb.—In mixed forest, Santa Rita, Mapastepec, No. 2018.

Sclerocarpus divaricatus (Benth.) Berth. & Hook.—In wet grassy field, Belem, Mapastepec, No. 16748; in thickets, Aguas Calientes, Escuintla, No. 17772.

Senecio callosus Sch. Bip.—In sunny volcanic rocky field, at 4000 m. alt., Vol. Tacaná, No. 2885.

Senecio chicharrensis Greenm.—In open ravine, near Unión Juárez, Vol. Tacaná, No. 2756.

Senecio chinotegensis Klatt.—In sandy field, Cintalapa, Escuintla, No. 17422; in sunny thickets, Rancho Quemado, Acapetahua, No. 17405; in open woods, Estacado, Mapastepec, No. 2010.

Senecio cobanensis Coult.—In open woods, Mt. Ovando, No. 713; in open pine woods, Siltepec, No. 1550.

Senecio cristobalensis Greenm.—In sunny margin of forest, Mt. Pashtal, No. 733; in open pine woods, at 1100 m. alt., Mt. Ovando, Nos. 2103, 16250.

Senecio kermesinus Hemsl.—In open secondary thickets, Mt. Ovando, No. 729.

Senecio parasiticus Hemsl.—In open thickets, Mt. Pashtal, Sierra Madre, No. 739; in wet woods, Siltepec, No. 1573.

Senecio picrides Schauer.—On sunny volcanic rocky ridge, at 4000 m. alt., Vol. Tacaná, No. 2364.

Senecio Schaffneri Sch. Bip.—In wet forest, Mt. Pashtal, No. 734.

Senecio uspananensis (Coult.) Greenm.—In open thickets, Mt. Ovando, Nos. 3926, 16257; in open pine woods, Pinada, Siltepec, No. 1941.

Sigesbeckia jorullensis H.B.K.—In open woods, Mt. Malé, No. 4606; in mixed forest, Mt. Pashtal, Sierra Madre, No. 747.

Sonchus oleraceus L.—In open woods, at 1000 m. alt., north slope, Vol. Tacaná, No. 2471; in wet open field, Finca Juárez, Escuintla, No. 1780.

Spilanthes americana forma *parvifolia* (Benth.) A. H. Moore.—In open field, at 1500 m. alt., near Aguas Calientes, north slope, Vol. Tacaná, No. 2469.

Spilanthes ocymifolia (Lam.) A. H. Moore.—In second growth, Mt. Ovando, Nos. 723, 6180; in grassy field, Esperanza, Escuintla, No. 6036; in grassy sandy field, Mojara, Tonalá, No. 17607.

Stevia elatior HBK.—In wet field, at 1200 m. alt., Nuevo Amatenango, No. 4747.

Stevia elongata var. *caracasana* (DC.) Rob.—In pine woods, at 1900 m. alt., Mt. Ovando, No. 16233.

Stevia lucida Lag.—In open woods, at 1500 m. alt., Mt. Ovando, No. 16268.

Stevia monardaefolia H.B.K.—In open thickets, Mt. Pashtal, Sierra Madre, No. 746; in open bushes, Siltepec, Nos. 833, 864.

Stevia ovata Willd.—In open field, Barranca Honda, Siltepec, No. 4088.

Stevia polyccephala Bertol.—In second growth, near Chiquihuite, Vol. Tacaná, No. 2848; in secondary thickets, Siltepec, No. 855.

Stevia rhombifolia H.B.K.—In open forest edge, Mt. Ovando, Nos. 773, 4018.

Stevia tomentosa H.B.K.—In sunny pine woods, Pinada, Siltepec, No. 1908.

Synedrella nodiflora (L.) Gaerth.—On sandy river bank, Escuintla, No. 557.

Tagetes filifolia Lag.—In open woods, Siltepec, No. 1666; in open mixed woods, Barranca Honda, Siltepec, No. 4099.

Tagetes florida Sweet.—In grassy field, at 2700 m. alt., north slope, Vol. Tacaná, No. 2344. Local name: "Anisillo."

- Tagetes foetidissima* DC.—In grassy field, Siltepec, No. 1557; in secondary thickets, Mt. Ovando, No. 4002.
- Tagetes jaliscensis* Greenm.—In open thickets, Escuintla, No. 2120.
- Tagetes Schiedeana* Less.—In secondary thickets, Siltepec, No. 1556.
- Taraxacum officinale* Wigg.—In grassy wet field, Ventana, Siltepec, No. 4544; in open field, at 1400 m. alt., south slope, Vol. Tacaná, No. 18293.
- Tithonia diversifolia* (Hemsl.) Gray.—In second growth, Acacoyagua, Nos. 789, 17618, 17033; in second growth, Mt. Ovando, Nos. 6183, 6160.
- Tithonia longeradiata* (Bertol.) Blake.—In open bushes, Siltepec, No. 794.
- Tithonia Pittieri* (Greenm.) Blake.—In second growth, San Nicolás, Montecristo, No. 1957.
- Tithonia rotundifolia* (Mill.) Blake.—In second growth, at 1000 m. alt., Mt. Ovando, No. 6177.
- Tragoceros Schideanum* Less.—In sandy field side, Mazapa, No. 4816.
- Trichospia menthoides* H.B.K.—In grassy thickets, near beach, Las Garzas, Acapetahua, No. 2710. Common in South America and Cuba, new to Mexican flora.
- Verbesina crocea* (Cw.) Less.—In open thickets, Mt. Ovando, Nos. 716, 3949.
- Verbesina Fraseri* Hemsl.—In second growth, at 1200 m. alt., Mt. Ovando, No. 6131.
- Verbesina myriocephala* Sch. Bip.—In open woods, at 1200 m. alt., Mt. Ovando, No. 6032.
- Verbesina phyllolepis* Blake.—In open pine woods, Mt. Ovando (type locality), No. 3958.
- Verbesina punctata* Rob. & Greenm.—In second growth, Mt. Ovando, No. 718.
- Verbesina serrata* Cav.—In second growth, Siltepec, Nos. 798, 1553.
- Verbesina sublobata* Benth.—In second growth, at 1500 m. alt., north slope, Vol. Tacaná, No. 2495.
- Verbesina turbacensis* H.B.K.—In second growth thickets, Barranca Honda, Siltepec, No. 4067; in second growth, Mt. Ovando, No. 436.
- Vernonia acilepa* Benth.—In thickets, Esperanza, Escuintla, No. 17442.
- Vernonia argyropappa* Buek.—In second growth, Pinada, Siltepec, No. 1914.
- Vernonia canescens* H.B.K.—In open thickets, at 1000 m. alt., north slope, Vol. Tacaná, No. 2479; in second growth, south slope near Unión Juárez, Vol. Tacaná, No. 2784.
- Vernonia Deppeana* Less.—In open woods, Mt. Ovando, No. 705; in thickets, Vol. Tacaná near Unión Juárez, No. 2712; in field, Cascada, Siltepec, No. 5163.
- Vernonia leiocarpa* DC.—In open woods, near Unión Juárez, south slope, Vol. Tacaná, No. 2776; in edge of forest, north slope, Vol. Tacaná, No. 2993.
- Vernonia patens* H.B.K.—In second growth, Escuintla, No. 1081. Local name: "Squinai."
- Vernonia polyleptura* Blake, Jour. Wash. Acad. Sci. 28: 478. 1938.—In second growth, Mt. Ovando (type locality), No. 730.
- Vernonia salvinae* Hemsl.—In forest, near Unión Juárez, south slope, Vol. Tacaná, No. 2761; in open woods, at 2500 m. alt., Pinabeto, Motozintla, No. 5455.
- Vernonia tortuosa* (L.) Blake.—In second growth, Escuintla, No. 736; in secondary thickets, Esperanza, Escuintla, No. 2031.
- Vernonia triflosculosa* H.B.K.—In open field, Mt. Ovando, No. 1561; in sandy open thickets, along road side, Escuintla, No. 16467.
- Werneria nubigena* H.B.K.—On sunny volcanic stony ground, at 4000 m. alt., near Vol. Tacaná, Nos. 2321, 2880.
- Zexmenia ceanothifolia* (Willd.) Sch. Bip.—In edge of forest, Siltepec, No. 1559.

Zexmenia frutescens (Mill.) Blake.—In open woods, Mt. Ovando, Nos. 790, 4200; in forest, San Vicente, Tapachula, No. 2507.

Zexmenia hispida Gray.—In savanna dry thickets, Chicomuselo, No. 4428.

Zexmenia Salvini Hemsl.—In forest, north slope, at 2000 m. alt., Vol. Tacaná, No. 2477; in open thickets, Mt. Pashtal, No. 742.

Zinnia elegans Jacq.—In dry field, near beach, Paredon, Tonalá, No. 17024.

Monocotyledoneae

TYPHACEAE

Typha angustifolia L.—In swamp, near beach, Las Garzas, Acapetahua, No. 2685.

POTAMOGETONACEAE

Ruppia maritima L.—In brook or swamp, near beach, Las Garzas, Acapetahua, No. 2725.

ALISMACEAE

Lophotocarpus guyanensis (H.B.K.) J. G. Smith.—In sunny swamp, Chicomuselo, No. 4511.

Sagittaria lancifolia L.—In swampy field, Cerrito, Acapetahua, No. 16829.

BUTOMACEAE

Limncharis flava (L.) var. *minor* Buch.—In sunny swamp, Chicomuselo, No. 4494.

GRAMINEAE

Agropyron conchroides Humb. & Bonpl.—In open edge of woods, Mt. Ovando, No. 2557.

Andropogon hirtiflorus (Nees) Kunth.—In pine woods, Montecristo, No. 1964.

Andropogon mexicanus Hitchc.—In open mixed woods, Montecristo, No. 1965.

Antheophora hermaphrodita (L.) Kuntze.—In swampy field, near beach, Mojarra, Tonalá, No. 17219.

Aristida Schiedeana Trin. & Rupr.—In sunny grassy field, Siltepec, No. 1603.

Arthrotylidium Pittieri Hack.—In woods, at 1500 m. alt., Mt. Ovando, No. 2636.

Arundinella confinis (Schult.) Hitchc. & Chase.—In open pine woods, Montecristo, No. 1982.

Arundinella Deppeana Nees.—In field, Siltepec, Nos. 320, 5095; in pine woods, Montecristo, No. 1948; in sandy field, Escuintla, Nos. 2033, 17282; in grassy field, near Unión Juárez, south slope, Vol. Tacaná, No. 2793.

Bouteloua hirticulmis Scribn.—In grassy field, Escuintla, No. 342.

Bromus laciniatus Beal.—In sunny thickets, at 1500 m. alt., north slope, Vol. Tacaná, No. 2444; in grassy field, Siltepec, No. 1711; in grassy thickets, Mt. Pashtal, Sierra Madre, No. 317.

Calamagrostis tolucensis (H.B.K.) Trin.—On volcanic stony ground, near peak, at 4000 m. alt., Vol. Tacaná, No. 2863.

Cenchrus echinatus L.—In sandy grassy thickets, near beach, Las Garzas, Acapetahua, No. 2724.

Cenchrus pauciflorus Benth.—On sandy river side, Nuevo Amatenango, No. 4778.

Chaetium bromoides (Presl.) Benth.—In grassy field, Siltepec, No. 1591.

Chusquea longifolia Swallen.—In open forest, at 2500 m. alt., north slope, Vol. Tacaná, No. 2373.

Chusquea serrulata Pilger.—In riverside bushes, Honduras, Siltepec, No. 4418; in mixed forest, Nuevo Amatenango, No. 4740.

- Chusquea sulcata* Swallen.—In open forest, Mt. Ovando, No. 321.
Coix Lacryma-jobi L.—In field often cultivated, San Vicente, Tapachula, No. 2515.
Cynodon dactylon (L.) Pers.—In grassy field, Chicomuselo, No. 4454; in grassy field, Siltepec, No. 1605.
Dactyloctenium aegyptium (L.) Richt.—In sandy grassy thickets, near beach, Las Garzas, Acapetahua, No. 2709.
Digitaria sanguinalis (L.) Scop.—In grassy field, Escuintla, No. 338.
Echinochloa crusgalli (L.) Beauv.—On sandy river side, Malpaso, Siltepec, No. 4529.
Eragrostis ciliaris (L.) Link.—In grassy field, Siltepec, No. 315; in fields, Cacahuatan, No. 16419.
Eragrostis domingensis (Pers.) Steud.—In sandy grassy thickets, Las Garzas, Acapetahua, No. 2722.
Eragrostis hypnoides (Lam.) B. & P.—In sandy field, Paredon, Tonalá, No. 16277.
Eragrostis limbata Fourn.—In sandy field, Escuintla, No. 346.
Eragrostis maypurensis (H.B.K.) Steud.—On sandy, sunny soil, Escuintla, No. 2131.
 Local name: "Pan Caliente."
Festuca tolucensis H.B.K.—In woods, at 3500 m. alt., north slope, Vol. Tacaná, Nos. 2337, 2360.
Gouinia virgata (Presl.) Scribn.—In wet grassy field, Mojarra, Tonalá, No. 17205; in wet grassy field, Esperanza, Escuintla, No. 17182.
Hackelochloa granularis (L.) Kuntze.—In wet grassy field, Escuintla, No. 1794.
Heteropogon contortus (L.) Beauv.—In sandy, sunny grassy field, Mazapa, No. 4835.
Ichnanthus axillaris (Nees) Hitchc.—In shaded forest, at 1500 m. alt., on north slope, Vol. Tacaná, No. 2500.
Isachne arundinacea (Swartz.) Griseb.—In grassy field, near Unión Juárez, south slope, Vol. Tacaná, No. 2759; in field, at 2000 m. alt., Frailesca, Siltepec, No. 5202.
Jouvea pilosa (Presl.) Scribn.—In sandy grassy field, near beach, Las Garzas, Acapetahua, No. 2718.
Lasiacis procerima (Hack.) Hitchc.—In sandy thickets, Jilguero, Escuintla, No. 17286; in open woods, Mt. Ovando, No. 18265.
Lasiacis ruscifolia (H.B.K.) Hitchc.—On sandy river side, Escuintla, Nos. 2117, 17180; in forest shade, Salina, Montecristo, No. 1939; in shaded bushes, Mojarra, Tonalá, No. 17204.
Lasiacis sorghoidea (Desv.) Hitchc. & Chase.—In woods, at 1000 m. alt., Mt. Ovando, No. 3987.
Monanthochloe littoralis Engelm.—On sandy beach, Tonalá, No. 16310. New to Chiapas.
Muhlenbergia Emerstei Vasey.—In sunny field, Escuintla, No. 310; in field, Barranca Honda, Siltepec, No. 4124; in open field, Mt. Ovando, No. 322.
Muhlenbergia macroura (H.B.K.) Hitchc.—In sandy field, south slope near Chiquihuite, Vol. Tacaná, No. 2829; in sunny field, at 2500 m. alt., north slope, Vol. Tacaná, No. 2420.
Olyra latifolia L.—In thickets, Escuintla, Nos. 341, 16973.
Oryza latifolia Desv.—In swampy field, Escuintla, Nos. 1802, 16703.
Oryza sativa L.—Cultivated in Escuintla and vicinity. Local name: "Arroz."
Oplismenus Burmannii (Retz.) Beauv.—In grassy field, Acacoyagua, No. 2130; in sandy field, Mojarra, Tonalá, No. 17237.
Panicum biglandulare Scr. & Smith.—On pine ridge, Finca Suiza, Montecristo, Nos. 2006, 5299; in mixed woods, Mt. Pashtal, No. 316.
Panicum boliviense Hack.—In field, at 150 m. alt., Escuintla, No. 1861.
Panicum bulbosum H.B.K.—In pine woods, Nuevo Amatenango, No. 4742.

- Panicum cayennense* Lam.—In grassy field, Escuintla, No. 1799.
Panicum fasciculatum Swartz.—In grassy field, Escuintla, No. 326.
Panicum frondescens Meyer.—In grassy field, Acacoyagua, Escuintla, No. 332.
Panicum pulchellum Raddi.—In forest shade, Ulapa, Mapastepec, No. 1999.
Panicum xalapense H.B.K.—In field, near Unión Juárez, Vol. Tacaná, No. 2750.
Paspalum candidum Kunth.—In grassy field, Escuintla, No. 318.
Paspalum fasciculatum Willd.—In wet field, Esperanza, Escuintla, No. 16416.
Paspalum lividum Trin.—In grassy field, Siltepec, No. 1604.
Paspalum paniculatum L.—In grassy field, Mojarra, Tonalá, No. 17209; in grassy field, Jilguero, Escuintla, No. 17265.
Paspalum plicatulum Michx.—In wet field, Esperanza, Escuintla, No. 16983.
Paspalum repens Berg.—In field, near beach, Paredon, Tonalá, No. 17021.
Pennisetum bambusiforme (Fourn.) Hemsl.—In thickets, near Unión Juárez, Vol. Tacaná, No. 2799; in field, at 1600 m. alt., Cascada, Siltepec, No. 5096.
Pharus glaber L.—In field, Escuintla, No. 18227.
Poa annua L.—In dry grassy field, at 2800 m. alt., west slope, Vol. Tacaná, No. 2888; in grassy field, Escuintla, No. 312.
Poa seleri Pilger.—In field, at 2000 m. alt., near Aguas Calientes, north slope, Vol. Tacaná, No. 2357.
Phragmites communis Trin.—In grassy thickets, Las Garzas, Acapetahua, No. 2694.
Saccharum officinarum L.—Cultivated in "Tierra caliente" zone, from sea level to 1700 m. alt. Local name: "Caña de Azúcar."
Setaria geniculata (Lam.) Beauv.—In field, Cascada, Siltepec, No. 1630; in open woods, Siltepec, No. 1712; in grassy field, north slope, Vol. Tacaná, No. 2969; in sandy grassy field, Escuintla, No. 17289.
Setaria paniculifera (Steud.) Fourn.—In sandy thickets, Escuintla, Nos. 347, 17635; in field, north slope, Vol. Tacaná, No. 2464; in sandy, sunny field, near beach, Mojarra, Tonalá, No. 17210.
Sporobolus Poirerii (Roem. et Schult.) Hitchc.—In field, Escuintla, No. 335. Local name: "Cola de Raton."
Stipa virescens H.B.K.—In field, at 2000 m. alt., north slope, Vol. Tacaná, No. 2419.
Trichachne insularis (L.) Nees.—In pineland, Mt. Malé, No. 4660.
Tricholaene repens (Willd.) Hitchc.—In pine woods, Mt. Malé, No. 4603.
Tricholaene rosea Nees.—In field, Escuintla, No. 333.
Trisetum irazuense (Kuntze) Hitchc.—In field, Escuintla, No. 345.
Trisetum Pringlei (Scribn.) Hitchc.—In pineland, at 4000 m. alt., Vol. Tacaná, No. 2342.
Trisetum Rosei Scribn. & Merr.—In pine woods, at 3000 m. alt., Mt. Malé, No. 4703.
Triticum aestivum L.—Cultivated in Porvenir and Rodeo, at 2700-3000 m. altitude. Local name: "Trigo."
Uncinia hamata (Sw.) Urban.—In grassy pine woods, Montecristo, No. 1319.
Uniola Pittieri Hack.—In sandy thickets, Las Garzas, Acapetahua, No. 2723.
Zea Mays L.—Cultivated in all zones, from the sea level to 3000 m. altitude. Local name: "Maíz."
Zeugites latifolia (Fourn.) Benth.—In field, Escuintla, No. 18224.

CYPERACEAE

- Bulbostylis hirtella* (Schred) Pers.—In open field, Santa Elena, Acapetahua, No. 16752.

Carex anisostachya Liebm.?—On wet ridge, in pine woods, at 3000 m. alt., Mt. Malé, No. 4632.

Carex polystachya Sw.—In open woods, Mt. Malé, No. 4622; in second growth, Mt. Pashtal, No. 1648; in open forest, Mt. Ovando, No. 2565.

Cyperus articulatus L.—In wet swampy land, near beach, Belem, Mapastepec, No. 17593.

Cyperus brevifolius (Rottb.) Hassk.—In grassy pine woods, Mt. Malé, No. 4649.

Cyperus canus Presl.—On brook side, Honduras, Siltepec, No. 4412; on brook side, Tapachula, No. 17706.

Cyperus densicaespitosus Mattf. & Kukenth.—In field, Esperanza, Escuintla, No. 297.

Cyperus diffusus Vahl.—In wet shaded woods, Esperanza, Escuintla, No. 16574. Local name: "Cinturina."

Cyperus diffusus subsp. *Chalaranthus* (Persl.) Kukenthal.—In pine woods, Mt. Ovando, No. 2553.

Cyperus diffusus var. *chorisanthus* (C. B. Clarke) Kukenthal.—On brook side, Finca Juárez, Escuintla, No. 1753.

Cyperus diffusus var. *tolucensis* (H.B.K.) Kukenthal.—On brook side, Escuintla, Nos. 301, 306.

Cyperus esculentus L.—On brook side, Mazapa No. 3851.

Cyperus hermaphroditus (Jacq.) Standl.—In open wet bushy area, Mt. Ovando, Nos. 2567, 4683.

Cyperus hermaphroditus var. *longiradiatus* (Liebm.) Kukenthal.—In thickets, west slope, Vol. Tacaná, No. 2424.

Cyperus ischnos Schl.—In savanna grassy wet land, Chicomuselo, No. 4480.

Cyperus lanceolatus Poir.—In wet grassy field, Chicomuselo, No. 4486.

Cyperus lanceolatus var. *compositus* Presl.—On brook side, Cascada, Siltepec, No. 1737.

Cyperus ligularis L.—In brookside wet thicket, Escuintla, No. 304; in swampy field, near beach, Mojarra, Tonalá, No. 17193.

Cyperus niger R. & P.—In grassy field, at 3000 m. alt., Rodeo, Siltepec, No. 4557.

Cyperus regiomontanus Britton.—Moist field, Las Garzas, No. 2719; in brookside wet field, Escuintla, No. 303.

Cyperus simplex H.B.K.—In wet thickets, Escuintla, No. 305; in wet woods, Mt. Madre Vieja, No. 2518.

Cyperus surinamensis Rottb.—In wet field, Escuintla, No. 298; on sandy sunny river side, Jilguero, Escuintla, No. 17271.

Dichromena ciliata Vahl.—In field, Nandolopez, Acapetahua, Nos. 16646, 17504.

Dichromena radicans Schl. & Cham.—In woods, at 1000 m. alt., Mt. Ovando, No. 6064.

Eleocharis elegans (H.B.K.) R. & S.—On Suchiate River bank, near Unión Juárez, Vol. Tacaná, No. 2783; on bank of Cintalapa River, Escuintla, No. 18283.

Eleocharis filiculmis Kunth.—In pine woods, Montecristo, No. 1977; in grassy field, Chicomuselo, No. 4484.

Eleocharis geniculata (L.) R. & S.—On swampy brook side, Finca Suiza, Montecristo, No. 1990.

Eleocharis nodulosa (Roth.) Schult.—In savanna swampy field, Chicomuselo, No. 4495.

Eleocharis retroflexa (Poir) Urban.—On brook side, near Unión Juárez, south slope, Vol. Tacaná, No. 2795.

Fimbristylis diphylla (Retz.) Vahl.—In wet field, Escuintla, No. 309.

Fimbristylis spadicea (L.) Vahl.—On brook side, near beach, Las Garzas, Acapetahua, No. 2720.

Fimbristylis spathacea Roth.—In field, near beach, Paredon, Tonalá, No. 16308.

Hemicarpha micrantha (Vahl.) Pax.—In brookside field, Mazapa, No. 4804.

Lipocarpha maculata (Mich.) Farr.—In grassy pine woods, Montecristo, No. 1985.

Rhynchospora dives Standl.—On brook side, Finca Juárez, Escuintla, No. 1751.

Rhynchospora Schiedeana Kunth.—In pine woods, at 2000 m. alt., north slope, Vol. Tacaná, No. 2400; in sandy field, Escuintla, No. 308.

Rhynchospora vulcani Boeckl.—On brook side, at 2100 m. alt., near Aguas Calientes, north slope, Vol. Tacaná, No. 2964.

Scleria secans (L.) Urban.—In thickets, Mt. Madre Vieja, No. 2521. Local name: "Navajuela."

Uncinia hamata (Sw.) Urban.—In grassy pineland, Montecristo, No. 1938.

PALMAE

Chamaedorea Aguilariana Standl. & Steyerl.—In forest, at 1200 m. altitude, Mt. Ovando, No. 6132. Local name: "Pacaya." New to Mexican flora.

Chamaedorea elegans Mart.—In wet ravine, at 1500 m. alt., Mt. Ovando, No. 18281.

Chamaedorea tenerrima Burret.—In wet forest, Boqueron, Motozintla, No. 5344.

Chamaedorea tepejilote Liebm.—In wet ravine, Esperanza, at 200 m. alt., Escuintla, No. 17534.

Cocos nucifera L.—Mostly cultivated, in coastal zone. Local name: "Coco."

Geonoma binervia Oerst.—In wet forest, Cacaluta, Escuintla, Nos. 16384, 16820. Local name: "Estapil."

Sabal mexicana Mart.—On Pacific Coast. Local name: "Palma Real."

Scheelea preussii Burret.—Common in "Tierra Caliente" zone, from sea level to 700 m. alt. Local name: "Manaco," "Coroso."

CYCLANTHACEAE

Carludovica chiapensis Matuda, Torrey Bot. Club. 76: 210-212. 1949.—In wet forest, at 700-900 m. alt., Finca Córcega, Pueblo Nuevo Comalatlán (type locality), Nos. 17965, 17697.

ARACEAE

Anthurium aemulum Schott.—On tree, in woods, Esperanza, Escuintla, Nos. 980, 16566; in shaded woods, Nandolopez, Acapetahua, No. 17867; in wet woods, Huehuetán, No. 18021. Local name: "Conte cinco dedo."

Anthurium chiapense Standl., Field Mus. Nat. Hist. 22: 67. 1940.—On rock or tree trunk, in wet shaded forest, at 2000 m. alt., Mt. Ovando (type locality), No. 1562.

Anthurium crassinervium (Jacq.) Schott.—Among rocks, in wet forest, La Grada, Escuintla, No. 16776; among wet rocks, Esperanza, Escuintla, No. 16377.

Anthurium giganteum Matuda.—In wet woods, at 400 m. alt., Salto de Agua, Escuintla (type locality), No. 18043.

Anthurium montanum Hemsl.—On log, in forest, at 1500 m. alt., Mt. Ovando, Nos. 17744, 4212; San Luis, Siltepec, No. 18276; in forest, at 1800 m. alt., San Juan Panamá, Escuintla, No. 18167; in forest, at 2300 m. alt., Saxchanal, No. 17805.

Anthurium scandens (Aubl.) Engler.—On tree, in forest, at 1900 m. alt., Mt. Ovando, Nos. 2097, 4205; in wet forest, at 1900 m. alt., San Juan Panamá, Escuintla, No. 18195; in forest, Siltepec, at 1700 m. alt., No. 18301.

Caladium bicolor (Ait.) Benth.—Cultivated, Acacoyagua, No. 17700. Local name: "Capotillo."

Dieffenbachia seguina (L.) Schott.—In wet shaded forest, Esperanza, Escuintla, Nos. 16765, 16569. Local name: "Hoja de Cochi," "Camilichigui."

Monstera pertusa Liebm.—On tree, in wet forest, Esperanza, Escuintla, No. 16592. Local name: "Mimbres," "Bejuco de Tuza."

Monstera acacoyaguensis Matuda, Madroño 10: 48. 1949.—In shaded forest, Acacoyagua, near Escuintla (type locality), No. 17853.

Monstera Karwinskyi Schott.—In wet woods, Esperanza, Escuintla, No. 17015. Local name: "Arpon."

Monstera roseopadix Matuda, Madroño 10: 47. 1949.—In forest, Esperanza, Escuintla (type locality), No. 18157.

Philodendron anisotomum Schott.—In wet forest, Esperanza, Escuintla, No. 16661. Local name: "Conte Alita."

Philodendron calderense Krause.—In forest, Esperanza, Escuintla, No. 16697; in forest, Triunfo, Escuintla, No. 18172. Local name: "Chupapito." Fine Mimbres.

Philodendron linearipetiolatum Matuda, Madroño 10: 49. 1949.—In shaded forest, at 500 m. alt., Violeta, near Libertad, Acacoyagua, No. 18176; in advanced forest, Finca Córcega, Pueblo Nuevo Comaltilán (type locality), No. 17781.

Philodendron tripartitum (Jacq.) Schott.—In wet forest, Esperanza, Escuintla, at alt. 150 m., Nos. 17768, 17966.

Philodendron oxycardium Schott.—In woods, Esperanza, Escuintla, Nos. 16633, 18170, 18169, 18171. Local name: "Conte Corazón."

Pistia stratiotes L.—In swamp, near beach, Las Garzas, Acapetahua, No. 3387; in swamp, Paredon, Tonalá, No. 16275.

Spathiphyllum Friedrichthalii Schott.—In wet woods, brook side, Esperanza, Escuintla, Nos. 17013, 17645, 2742. Local name: "Bushná."

Spathiphyllum phrynifolium Schott.—In shaded forest, Esperanza, Escuintla, No. 16561; in wet bushy area, Huehuetán, No. 18022. Local name: "Bushná."

Syngonium Donnell-Smithii Engler.—In wet forest, at 700 m. alt., Córcega, Pueblo Nuevo Comaltilán, No. 17831; in wet forest or woods, Esperanza, Escuintla, No. 16512. Local name: "Conte Tres Punta"; Nandolopez, Acapetahua, No. 17856.

Syngonium podophyllum Schott.—In forest, Esperanza, Escuintla, No. 16723; in forest, Jilguero, Escuintla, No. 17284. Local name: "Siete Dedos."

Xanthosoma mexicanum Liebm.—In wet shady forest edge, Esperanza, Escuintla, No. 16383. Local name: "Capote blanco chico."

Xanthosoma pedatum Hemsl.—In grassy sunny thickets, Acacoyagua, No. 16392; in bushes, Islamapa, Huehuetan, No. 18020.

Xanthosoma roseum Schott.—In wet thickets or on brook side, Esperanza, Escuintla, Nos. 16831, 16563, 17644; in wet woods, Salto de Agua, at 500 m. alt., No. 18293. Local name: "Capote blanco grande."

Xanthosoma violaceum Schott.—Cultivated in gardens, Esperanza, Escuintla, No. 16631. Local name: "Capote de Jardín."

Xanthosoma Wendlandii Schott.—In riverside thickets, at 900 m. alt., Mazapa, No. 4859.

BROMELIACEAE

Aechmea magdalenae André.—In thickets, at coastal zone. Local name: "Pita Floja," without number.

Ananas comosus (L.) Merrill.—Cultivated. Local name: "Piña."

Billbergia mexicana Mez.—In sunny rocky field, Mazapa, No. 4849.

Bromelia karatas L.—In thickets or in bushes. Local name: "Piñuela."

Bromelia Pinguin L.—In sandy thickets, near beach, Cerrito, Acapetahua, Nos. 16753, 17721. Local name: "Rasca Culo."

Catopsis floribunda L. B. Smith.—On tree, in forest, Honduras, Siltepec, No. 4395.

Catopsis Hahnii Bak.—On tree, in woods, Saxchanal, Sierra Madre.

Catopsis nutans var. *stenopetala* (B. & K.) L. B. Smith.—In wet forest, Escuintla, Nos. 6075, 16836.

Catopsis triticea L. B. Smith, Contr. Gray Herb. Harv. Univ. 127: 19. 1939.—On tree, in forest, Mt. Ovando (type locality), Nos. 2570, 4155.

Hechtia Ghiesbreghtii Lem.—In sunny field, Mazapa, de Madero, No. 4848.

Lindmania micrantha (Lindl.) L. B. Smith.—On rock, near Cintalapa River, Jilguero, Escuintla, Nos. 17263, 17427; on wet rock, in woods, at 1700 m. alt., Mt. Ovando, Nos. 6204, 7076.

Pitcairnia Carioana Wittm.—On rock, in forest, Niquivil, No. 5505.

Pitcairnia densiflora Brongn.—Mostly on rocks, in wet forest, Mt. Ovando, No. 1854.

Pitcairnia Hemsleyana Mez.—In wet forest, at 1500 m. alt., Mt. Ovando, No. 17729.

Pitcairnia heterophylla (Lindl.) Beer.—On tree or rocks, in forest, Mt. Ovando, No. 382.

Pitcairnia saxicola L. B. Smith.—On sunny rock, Mt. Ovando, No. 4226.

Pitcairnia Tuerckheimii Donn. Sm.—In woods, La Grandeza, No. 5567.

Tillandsia argentea Gris.—On tree, in woods, La Grandeza, No. 5605.

Tillandsia Butzii Mez.—On tree, in forest, Mt. Pashtal, No. 358; in forest, Mt. Ovando, No. 2657.

Tillandsia capitata var. *guzmanioides* L. B. Smith, Contr. Gray Herb. Harv. Univ. 127: 18. 1939.—On tree, in forest, at 3000 m. alt., north slope, Vol. Tacaná (type locality), No. 2308; in woods, Saxchanal, Sierra Madre, No. 4323.

Tillandsia Caput-Medusae E. Morr.—On tree, in woods, Chicomuselo, No. 4509; in forest, Frailesca, Siltepec, No. 5279; in forest, at 700 m. alt., Córcega, Pueblo Nuevo Comalatlán, No. 17828; in woods, Tuixcum, No. 5537; in woods, La Grandeza, Nos. 18287, 18265; in woods, Col. Turquía, Escuintla, Nos. 17668, 16854.

Tillandsia dasylirofolia Baker.—On tree, in woods, Paredon, Tonalá, No. 16272; in woods, at 200 m. alt., Turquía, Escuintla, Nos. 16838, 17279, 17415.

Tillandsia excelsa Griseb.—On tree, in forest, Mt. Ovando, No. 2071.

Tillandsia fasciculata Sw.—On tree, in forest, Mt. Ovando, Nos. 1845, 3974; in woods, Col. Cintalapa, Escuintla, No. 16837.

Tillandsia filifolia C. & S.—On tree in woods, Mt. Ovando, No. 2642; in woods, Mazapa, No. 4796.

Tillandsia flabellata Bak.—On tree, in woods, Haciendita, Escuintla, No. 5994; in forest, Honduras, Siltepec, No. 4379; in bushes, Chicomuselo, No. 4510; in woods, Frailesca, Siltepec, No. 5278; in wet woods, Salto de Agua, Acacoyagua, Nos. 16982, 17498, 16637; in woods, at 700 m. alt., Córcega, Pueblo Nuevo Comalatlán, No. 17829.

Tillandsia guatemalensis L. B. Smith.—On tree, in forest, Letrero, Siltepec, No. 4468; in forest, Niquivil, No. 5502; in woods, Frailesca, Siltepec, No. 5281.

Tillandsia juncea (R. & P.) Poir.—On tree, in open woods, Tuixcum, No. 5535; in open woods, at 1500 m. alt., Mt. Ovando, No. 18265.

Tillandsia polystachya L.—On tree, in forest, Siltepec, No. 5622; in forest, Honduras, Siltepec, No. 4378; in woods, at 150 m. alt., Esperanza, Escuintla, No. 17381.

Tillandsia ponderosa L. B. Smith.—In wet forest, Pico de Loro, No. 4275; in forest, Pinabeto, Motozintla, No. 5421.

Tillandsia punctulata Schl. & Cham.—On tree, in forest, Letrero, Siltepec, No. 4356.

Tillandsia racemosa (L.) Urban.—In woods, near beach, Cerrito, Acapetahua, No. 16754.

Tillandsia Schiedeana Staud.—On tree, in open oak woods, Honduras, Siltepec, No. 4380; in woods, near beach, Cerrito, Acapetahua, No. 17718.

Tillandsia Seleriana Mez.—On tree, in open oak woods, Honduras, Siltepec, No. 4373; in woods, Cacaluta, Escuintla, No. 17467.

Tillandsia usneoides L.—In pine woods, Vol. Tacaná, No. 2343; in woods, Cerro de Laguna, Mapastepec, No. 2044; in pine woods, Mt. Malé, Porvenir, No. 4604; in open mixed woods, Tuixcum, No. 5532.

COMMELINACEAE

Athyrocarpus leiocarpus (Benth) B. & Hook.—In the shade of wet forest, Escuintla, No. 2155.

Callisia monandra (Sw.) Schult.—In open edge of wet forest, Mt. Ovando, No. 965.

Callisia multiflora (Mart. & Gal.) Standl.—In open forest, Mt. Ovando, No. 2095.

Callisia repens L.—In wet thickets, Esperanza, Escuintla, Nos. 976, 2111.

Campelia zanonía (L.) H.B.K.—In margin of forest, Mt. Ovando, No. 3970; in the shade of wet forest, Escuintla, Nos. 795, 2163.

Commelina coelestis Willd.—In the shade of wet forest, Cascada, Siltepec, No. 1616.

Commelina diffusa Burn. f.—On wet river side, Mazapa, No. 4818.

Commelina elegans H.B.K.—In open woods, Mt. Ovando, No. 4015; in wet woods, Escuintla, No. 1048; in grassy woods, Las Garzas, Acapetahua, No. 1048.

Commelina erecta L.—In wet woods, Acacoyagua, No. 16853; on river side, Escuintla, No. 1863; in wet field, at 1200 m. alt., Mazapa, No. 4810.

Commelina longicaulis Jacq.—In thickets, Las Garzas, Acapetahua, No. 2671.

Leptorrhoea filiformis (Mart. et Gal.) Clarke.—In thickets, Escuintla, No. 2167.

Phaeosphaerion leiocarpum (Benth.) Hassk.—In margin of shaded forest, at 2000 m. alt., Larranca Honda, Siltepec, Nos. 4069, 4094; in wet shaded thickets, near beach, Mojarra, Tonalá, No. 2128.

Tinantia erecta (Jacq.) Schlecht.—In moist thickets, Escuintla, No. 2162; in open thickets, at 1200 m. alt., Mt. Ovando, No. 6054.

Tinantia leiantha Clarke.—In wet woods, Escuintla, No. 2184.

Tinantia leiocalyx C. B. Clarke.—In woods, Escuintla, Nos. 2110, 16632, 16981; in grassy wet shaded woods, near beach, Mojarra, Tonalá, Nos. 17187, 16901.

Tradescantia anisophylla Standl. Field Mus. Nat. Hist. 22: 4. 1940.—On brook side, near Aguas Calientes, Vol. Tacaná (type locality), No. 2505.

Tradescantia commelinoides R. & S.—In edge of forest, Escuintla, Nos. 1050, 1058, 16832; in woods, Mt. Ovando, Nos. 2242, 18184; in forest, Finca Suiza, Montecristo, No. 1927; in pine woods, Mt. Malé, Porvenir, No. 4610; in wet forest, at 2000 m. alt., Rodeo, Siltepec, No. 4569; San Luis, Siltepec, Nos. 18284, 4095, 18197, 5315; in woods, Frailesca, Siltepec, No. 5265; in woods, at 2300 m. alt., Tres Cruces, Sierra Madre, No. 5049.

Tradescantia cumanensis Kunth.—In shade of forest, Escuintla, Nos. 940, 2176.

Tradescantia chiapensis Standl., in Sched.—In wet sunny woods, Finca, Olvido, Montecristo (type locality), No. 1992; in open forest, Barranca Monda, Siltepec, No. 4097.

Tradescantia crassifolia Cav.—In shade of woods, Mazapa, No. 4839.

Tradescantia guatemalensis Clarke.—In wet woods, at 1700 m. alt., Mt. Ovando, No. 3919. New to Mexican flora.

Tradescantia mollipila Standl.—In wet forest Finca Suiza, Montecristo, No. 1973.

Tradescantia plusiantha Standl. Field Nat. Hist. 22: 6. 1940.—In edge of forest, Mt. Ovando (type locality), No. 2569; in edge of forest, Barranca Honda, Siltepec, No. 4117.

Tradescantia tacanana Standl. Field Nat. Hist. 22: 6. 1940.—In shade of forest, north slope, Vol. Tacaná (type locality), No. 2504; in forest, Barranca Honda, Siltepec, Nos. 4086, 4092.

Tripogandra disgrega (Kunth) Woodson.—In margin of wet woods, Mt. Ovando, No. 4160.

Weldenia candida Schult.—On stony sunny soil, at 4000 m. alt., Vol. Tacaná, No. 2324; in wet field, at 3000 m. alt., Rodeo, Siltepec, No. 4575.

PONTEDERIACEAE

Eichhornia azurea (Swartz.) Kunth.—In swamp, Paredon, Tonalá, No. 16292; in swampy field, Santa Elena, Acapetahua, No. 17259.

Eichhornia crassipes (Mart.) Solms.—In swamp at coastal region.

Heteranthera limosa (Sw.) Willd.—In swamp, Chicomuselo, No. 4489; in swampy low land, near beach, Paredon, Tonalá, No. 16942. Local name: "Hoja de Laguna."

Pontederia sagittata Presl.—In swampy field, Aguas Calientes, Escuintla, No. 16623; in swamp, Macuitián, Acapetahua, No. 17469. Local name: "Lirio de Laguna."

JUNCACEAE

Luzula gigantea Desv.—In grassy thickets, at 3000 m. alt., on north slope, Vol. Tacaná, No. 2594.

LILIACEAE

Schoenocaulon officinale (S. & C.) Gray.—In grassy thickets, Siltepec, No. 1600.

Smilacina amoena Wendl.—In open woods, at 2500 m. alt., Mt. Pashtal, No. 18190.

Smilacina flexuosa Bertol.—In wet forest, at 1500 m. alt., Saxchanal, No. 17808; in forest, Santa Rosa, Escuintla, Nos. 4237, 4256; in wet forest, Mt. Ovando, No. 374; in woods, Vol. Tacaná, Nos. 2463, 2846.

Smilacina paniculata M. & G.—In forest, Mt. Ovando, Nos. 359, 1825, 17734; in woods, at 2000 m. alt., Frailesca, Siltepec, Nos. 15268, 15266; in open woods, Mt. Malé, No. 4702.

Smilacina scilloidea M. & G.—In forest, at 2000 m. alt., near Aguas Calientes, Vol. Tacaná, No. 2365.

Smilax aristolochiaefolia Mill. & Gard.—In thickets or woods, Mt. Ovando, Nos. 352, 2092.

Smilax jalapensis Schl.—In open woods, at 2800 m. alt., Rodeo, Siltepec, No. 4573; in forest, Mt. Ovando, No. 6166; in woods, at 2500 m. alt., Pinabeto, Motozintla, No. 15424; in wet margin of forest, Frailesca, Siltepec, No. 5190.

Smilax lanceolata L.—In woods, Mt. Ovando, No. 3988; in edge of woods, Castaño, Acacoyagua, No. 1789; in woods, Barranca Honda, Siltepec, Nos. 4024, 5005; in thickets, Chicomuselo, No. 4473; in thickets, Aguas Calientes, Escuintla, No. 16614; in open woods, Acacoyagua, No. 16826.

Smilax mollis H. & B.—In forest, Nuevo Amatenango, No. 4711; in woods, Mt. Ovando, Nos. 4196, 18199.

Smilax Purpusii Brandeg.—In woods, Mt. Pashtal, Sierra Madre, No. 357; in second growth, Siltepec, No. 348; in second growth thickets, at 1600 m. alt., Frailesca, Siltepec, No. 15258.

Smilax rufa Lundell.—In open thickets, Mt. Malé, Porvenir (type locality), No. 4591.

Smilax spinosa Mill.—In thickets, near beach, Las Garzas, Acapetahua, No. 2807; in bushes, Escuintla, No. 2633.

Smilax subpubescens A. DC.—In sunny woods, at 2500 m. alt., Pinabeto, Motozintla, Nos. 5442, 15426; in open bushy area, mostly second growth, Libertad Calera, Motozintla, No. 5508.

Smilax velutina Killip & Morton.—In woods, Mt. Pashtal, Sierra Madre, No. 1644; in woods, Mt. Ovando, No. 351; in open forest, Mt. Madre Vieja, No. 381.

Taetsia fruticosa (L.) Merrill.—Cultivated in Acacoyagua, No. 17280.

Yucca baccata Torr.—Often cultivated, without number.

HAEMODORACEAE

Xiphidium caeruleum Aubl.—In woods, Esperanza, Escuintla, N. 2597; in wet forest, Cacao, Acacoyagua, No. 16615.

AMARYLLIDACEAE

Agave brachystachys Cav.—Siltepec, No. 1599. Cultivated by natives.

Beschorneria Tomelii Hook.—In mixed woods, Ojo de Agua, at the foot of Mt. Pashtal, No. 354.

Bomarea acutifolia (L. & D.) Herb.—In thickets, Siltepec, No. 1602; in thickets, at 2800 m. alt., south slope, Vol. Tacaná, No. 2854; in woods, Mt. Malé, No. 4651; in margin of cloud forest, at 2000 m. alt., Mt. Pashtal, No. 17685; in open thickets, at 2300 m. alt., Boqueron, No. 5387.

Bomarea edulis (Tuss.) Herb.—In open bushy area, Esperanza, Escuintla, No. 1797.

Bomarea gloriosa (S. & C.) M. Roem.—In thickets, Nuevo Amatenango, No. 4716; in forest edge, Finca Juárez, Escuintla, No. 1759.

Bomarea hirtella (HBK.) Herb.—In sunny thickets, Esperanza, Escuintla, No. 16458. Local name: "Arete de India."

Crinum erubescens Ait.—Cultivated commonly in garden, Escuintla, No. 16593. Local name: "Reina."

Crinum sp.—Cultivated, Esperanza, Escuintla, No. 16538.

Curculigo scorzonifolia (Lam.) Baker.—In savanna land, Malpaso, Siltepec, No. 4532.

Hippeastrum puniceum (Lam.) Urban.—Cultivated, Escuintla, No. 17487. Local name: "Lirio."

Hymenocallis litoralis (Jacq.) Salisb.—In grassy field, Esperanza, Escuintla, Nos. 3885, 16640. Distributed as *Pancratium litoralis* Jacq.

Hypoxis decumbens L.—In open woods, Nuevo Amatenango, No. 4772; in thickets, at 2000 m. alt., north slope, Vol. Tacaná, No. 2497; in grassy field, Chicomuselo, No. 4465.

DIOSCOREACEAE

Dioscorea carionis Prain & Burk.—In woods, Pinabeto, at 2580 m. alt., near Guatemalan border, No. 5482; in woods, near Chiquihuite, at 2800 m. alt., south slope, Vol. Tacaná, No. 2817; in bushes, at 1500 m. alt., Mt. Ovando, Nos. 6153, 6055.

Dioscorea convolvulacea C. & S.—In thickets, Mt. Pashtal, No. 1017; in open bushes, Escuintla, No. 2126.

Dioscorea convolvulacea var. *glabra* Uline.—In open thickets or bushes, Escuintla, Nos. 832, 945, 992, 17274.

Dioscorea cymosula Hemsl.—In thickets, Esperanza, Escuintla, No. 16543; in woods, at 1300 m. alt., Montecristo, No. 5939; in bushes, at 1000 m. alt., Malapso, Siltepec, No. 4534.

Dioscorea cyphocarpa Rob.—In thickets, Esperanza, Escuintla, No. 18231; in bushes, near Unión Juárez, at 1400 m. alt., south slope, Vol. Tacaná, No. 2781.

Dioscorea densiflora Hemsl.—In bushes, Escuintla, No. 1018.

Dioscorea floribunda M. & C.—In thickets, Nos. 831, 1743, 17076, 2143; in thickets, Mt. Ovando, No. 974; in bushes, at 1300 m. alt., Nuevo Amatenango, No. 4741.

Dioscorea Galeottiana Kunth.—In woods, at 1600 m. alt., Hacienda, 60 km. north-east of Escuintla, No. 5984.

Dioscorea Liebmannii Uline.—In thickets, near beach, Paredon, Tonalá, Nos. 16924, 17185. Local name: "Bombachi."

Dioscorea macrostachya Benth.—In sandy thickets, Jilguero, Escuintla, No. 16511; in open bushes, Santa Rosa, Tonalá, No. 17360.

Dioscorea pilosiuscula Bert.—In bushes, at 1700 m. alt., Finca Juárez, No. 1776.

Dioscorea polygonodes H. & B.—In bushes, Esperanza, Escuintla, Nos. 989, 2245.

Dioscorea spiculiflora Hemsl.—In thickets, Escuintla, Nos. 875, 2137; in bushes, Mt. Ovando, No. 1817; in bushes, Cacaluta, Escuintla, No. 17061.

Dioscorea tacanensis Lundell, Lloydia 2: 78. 1939.—In second growth, north slope, near Aguas Calientes, Vol. Tacaná (type locality), No. 2416.

IRIDACEAE

Cipura paludosa Aubl.—In savanna, Chicomuselo, No. 18211.

Orthrosanthus chimboracensis (H.D.K.) Baker.—In grassy field, Siltepec, No. 1634; in grassy thickets, Mt. Pashtal, Sierra Madre, Nos. 437, 18193; in pine woods, at 3000 m. alt., Mt. Malé, No. 18192.

Sisyrinchium alatum Hook.—In grassy field, Siltepec, No. 2257.

Sisyrinchium guatemalense (J. G. Baker) Standl. & Steyererm.—In wet woods, Honduras, Siltepec, at 1200 m. alt., No. 18303. New to Mexican flora.

Sisyrinchium Johnstonii Standl.—In pine woods, at 3000 m. alt., Mt. Malé, Nos. 18198, 4677, 4629; on dry ridge, at 3500 m. alt., Vol. Tacaná, No. 2358. New to Mexican flora.

Trimeza Martinicensis (Jacq.) Herb.—In sandy field, La. Grada, Escuintla, Nos. 16817, 16721.

MUSACEAE

Heliconia latispatha Benth.—In wet thickets, Esperanza, Escuintla, Nos. 16691, 16693; in field, Santa Elena, Acapetahua, No. 16735. Local name: "Platanillo."

Musa mexicana Matuda.—In wet sunny field, near Col. Hidalgo, Acacoyagua (type locality), No. 18320; moist sunny thickets, Cruz de Piedra, Acacoyagua, No. 18321; in brookside, wet field, Col. Cintalapa, Escuintla, No. 18319.

Musa paradisiaca L.—Cultivated in region "Tierra Caliente" to 1500 m. alt. Local name: "Platano," "Platano Macho."

Musa sapientium L.—Cultivated in region "Tierra Caliente" to 1500 m. alt. Local name: "Banano."

ZINGIBERACEAE

Costus Bakeri Schum.—In cloud woods, Mt. Pashtal, at 2000 m. alt., No. 353; in wet bushy area, Jilguero, Escuintla, at 300 m. alt., No. 17278.

Costus ruber Griseb.—In woods, Esperanza, Escuintla, No. 16379. Local name: "Caña Cristo."

Hedychium coronarium Koenig.—Cultivated, Esperanza, Escuintla, No. 16698. Local name: "Mariposa," "Flor blanca."

Hedychium Gardonianum Rose.—In wet forest, Mt. Ovando, No. 945.

Kaempferia rotunda L.—Cultivated, Acacoyagua, No. 17777. Local name "Hu:lfan'ro."

Renalmia aromatica (Aubl.) Griseb.—In wet forest, Mt. Ovando, No. 1844; in wet forest, Montecristo, No. 5953.

Renalmia exaltata L. f.—In shaded wet woods, Acacoyagua, No. 17472. Local name: "Huilmul."

CANNACEAE

Canna edulis Ker-Gawl.—In second growth, at 1000 m. alt., Mt. Ovando, No. 16252.

Canna indica L. (?).—In thickets, Escuintla, No. 16525. Local name: "Coshú," "Bandera."

MARANTHACEAE

Calathea Allouia (Aubl.) Lindl.—In shaded woods, Esperanza, Escuintla, No. 6074. Local name: "Macuse."

Calathea insignis Peters.—Along brookside thickets, Esperanza, Escuintla, No. 16706. Local name: "Hoja de Zope."

Calathea lutea (Aubl.) Meyer.—In wet thickets, at the forest of Mt. Ovando. Local name: "Hoja Blanca."

Calathea micans Koern.—In wet forest, Mt. Ovando, No. 1568, also collected in Sierra Madre.

Calathea microcephala (Poepp. & Engl.) Koern.—In wet woods, near Santa Maria, Siltepec, No. 5993.

Calathea sp.—In wet forest, Escuintla. Local name: "Hoja de Cuero."

Maranta arundinacea L.—In thickets, near beach, Paredon, Tonalá, No. 16928; in wet swampy thickets, Cintalapa, Escuintla, No. 16432.

Thalia geniculata L.—In sunny swamp, Escuintla, No. 1057; in swampy field, Acapetahua, No. 17243. Local name: "Banderita."

Pleiotachya pruinosa (Regel.) Schum.—In wet forest, Esperanza, Escuintla, No. 2610. Local name: "Lengua de Vaca."

BURMANNIACEAE

Gymnosiphon suaveolens (Karst.) Urban.—In wet forest, at 2000 m. alt., Pico de Loro, north of Escuintla, No. 4277.

ORCHIDACEAE

Arpophyllum alpinum Lindl.—On trees, in forest, Mt. Pashtal, No. 367.

Bletia reflexa Lindl.—In grassy field, Nuevo Amatenango, No. 4774.

Brassavola nodosa (L.) Lindl.—In open woods, Mt. Madre Vieja, No. 2522; in woods, Escuintla, Nos. 1793, 16388; in open woods, Cruz de Piedra, Acacoyagua, No. 2185; in woods, near beach, Belem, Mapastepec, No. 16739.

Brassia maculata R. Br.—In oak woods, Honduras, Siltepec, No. 4390.

Brassia verrucosa Lindl.—In wet forest, Mt. Ovando, No. 1930.

Bulbophyllum pachyrachis (A. Rich.) Griseb.—On tree, in riverside woods, Jalapa, Acacoyagua, No. 2055.

Campylocentrum micranthum (Lindl.) Rolfe.—On tree, in open woods, Esperanza, Escuintla, No. 2743; in woods, Turquia, Escuintla, No. 16833.

Catasetum integerrimum Hook.—On tree, in open bushes, Escuintla, No. 3880.

Catasetum Russellianum Hook.—On tree, in dry woods, Mazapa, No. 4886.

Cattleya aurantica Lindl.—On tree, in forest, at 1200 m. alt., south slope, Mt. Ovando, No. 16210; in forest, at 300 m. alt., Esperanza, Escuintla, No. 17440.

- Cattleya Skinneri* Batem.—On tree, in woods, Esperanza, Escuintla, Nos. 364, 17449. Local name: "San Sebastián." New to Mexican flora.
- Chysis laevis* Lindl.—On tree, in wet forest, Mt. Ovando, No. 2086.
- Coelia macrostachya* Lindl.—On tree, in forest, Siltepec, No. 1784.
- Compartmentia falcata* Poepp. & Endl.—On tree, in dry woods, Concordia, No. 5921.
- Corallorhiza maculata* Raf.—In pine woods, Mt. Malé, N. 4648.
- Corallorhiza Pringlei* Greenm.—In pine woods, Pinada, Siltepec, No. 1953.
- Cranichis ciliata* Kunth.—In pine woods, Mt. Ovando, No. 4189.
- Cranichis diphylla* Sw.—In mixed forest, Cerro de Laguna, Mapastepec, No. 2037.
- Cranichis hieroglyphica* Ames & Correll.—In mixed forest, Barranca Honda, Siltepec, No. 4114.
- Cranichis W'ageneri* Rchb. f.—In mixed forest, Mt. Ovando, No. 1807.
- Crybe rosea* Lindl.—In wet field, Cascada, Siltepec, No. 1167.
- Cyrtopodium punctatum* Lindl.—In stony rocky, or sandy thickets, Cintalapa, Escuintla, No. 2179.
- Dichaea graminoides* (Sw.) Lindl.—On tree, in wet forest, Mt. Ovando, No. 4181.
- Dichaea muricata* (Sw.) Lindl.—On tree, in forest, Mt. Ovando, No. 362.
- Dichaea neglecta* Schltr.—On tree, in forest, Mt. Ovando, No. 1811.
- Dichaea squarrosa* Lindl.—On tree, in forest, Cerro Boqueron, No. 5386; in wet forest, Letrero, Siltepec, No. 4332.
- Dichaea trichocarpa* (Sw.) Lindl.—On tree, in forest, north slope, Vol. Tacaná, No. 2995.
- Elleanthus capitatus* (R. Br.) Reichenb. f.—On tree, in forest, Mt. Malé, No. 4701; in wet forest, Mt. Ovando, Nos. 2587, 4207.
- Epidendrum arbuscula* Lindl.—On tree, in woods, Centanas, Siltepec, No. 4549; in forest, Rodeo, Siltepec, No. 4567; in forest, Cerro de Laguna, Mapastepec, No. 2048; in forest, north slope, Vol. Tacaná, No. 2345; in forest, Siltepec, No. 370.
- Epidendrum arbuscula* var. *radioferens* A. H. & S.—In forest, western slope, Vol. Tacaná, No. 2927.
- Epidendrum atropurpureum* Willd.—On tree, in woods, near beach, Cerrito, Acapetahua, Nos. 16761, 17717; in forest, at 150 m. alt., Esperanza, Escuintla, No. 17535.
- Epidendrum brassavolae* Rohb. f.—On sunny rocks, at 2300 m. alt., Mt. Ovando, No. 2537.
- Epidendrum chinense* (Lindl.) Ames.—On tree, in woods, Escuintla, No. 361; in woods, Siltepec, No. 371.
- Epidendrum ciliare* Jacq.—On tree, in forest, Nuevo Amatenango, No. 4758; in forest, Mt. Ovando, No. 2054.
- Epidendrum cobanense* Ames. & Schltr.—On tree, in pine woods, Montecristo, No. 1981. New to Mexican flora.
- Epidendrum cochleatum* L.—On tree, in forest, in Sierra Madre, No. 3303.
- Epidendrum difforme* Jacq.—On tree, in forest, Saxchanal, Sierra Madre, No. extra.
- Epidendrum ionophlebium* Reichenb. f.—On tree, in lowland riverside woods, Escuintla, No. 1013.
- Epidendrum lacertinum* Lindl.—In woods, Mt. Pashtal, No. 1572; in open forest, Tuixcum, Motozintla, No. 5533.
- Epidendrum Lindleyanum* (Batem.) Reichenb. f.—On tree, in oak woods, Tuixcum, Motozintla, No. 5603. Local name: "Flor de Mayo."
- Epidendrum myrianthum* Lindl.—On calcareous rock, at 2300 m. alt., Mt. Ovando, No. 2538.

Epidendrum ochraceum Lindl.—On tree, in forest, Mt. Ovando, Nos. 378, 1810; in forest, Siltepec, No. 1768; in open woods, Honduras, Siltepec, No. 4406; in woods, Mt. Pashtal, Sierra Madre, No. 1722; in forest, La Grandeza, No. 5609.

Epidendrum oncioides Lundl.—On tree, in forest, La Grandeza, No. 5006.

Epidendrum Parkinsonianum Hook.—In oak woods, La Grandeza, No. 5524.

Epidendrum paleaceum (Lindl.) Reichenb. f.—On tree, in woods, Honduras, Siltepec, No. 4407.

Epidendrum pentotis Reichenb. f.—On tree, in forest, Mt. Ovando, No. 1858.

Epidendrum polyanthum Lindl.—On tree, in riverside woods, Siltepec, Nos. 366, 1598.

Epidendrum propinquum A. Rich. & Gal.—On tree, in wet forest, Siltepec, No. 1589.

Epidendrum pygmaeum Hook.—On tree, in forest, Siltepec, No. 359; in woods, Mt. Pashtal, Sierra Madre, No. 1786; in woods, Barranca Honda, Siltepec, No. 4081.

Epidendrum radiatum Lindl.—On tree, in oak woods, Honduras, Siltepec, No. 4399; in woods, Nuevo Amatenango, No. 4757; in open woods, La Grandeza, No. 5608; in woods, Cacaluta, Escuintla, Nos. 17646, 17621.

Epidendrum radicans Pavón.—Mostly on sunny rocks, at 2500 m. alt., Vol. Tacaná, No. 2436; on moist rock, Unión Juárez, No. 2777; on limestone rock, Mt. Ovando, No. 379.

Epidendrum ramosum var. *mexum* (Schltr.) A. H. & S.—On tree, in pine woods, Mt. Ovando, No. 2555.

Epidendrum rigidum Jacq.—On tree, in mixed forest, Honduras, Siltepec, No. 4375.

Epidendrum Stamfordianum Batem.—On tree, in wet woods, Esperanza, Escuintla, No. 2057.

Epidendrum varicosum Batem.—On tree, in mixed woods, Haciendita, Siltepec, No. 1954; in woods, at 3000 m. alt., north slope, Vol. Tacaná, No. 2387; in mixed forest, Barranca Honda, Siltepec, No. 4084.

Epidendrum verrucosum Sw.—On limestone rock, at 2300 m. alt., Mt. Ovando, No. 2539; on sunny rock, at 2000 m. alt., north slope, Vol. Tacaná, No. 2506.

Epidendrum vitellinum Lindl.—On tree, in pine woods, Pinabeto, Motozintla, No. 5441.

Eulophia alta (L.) Fawc. & Randle.—In lowland thickets, Tejar, Escuintla, No. 2058.

Gongorea galeata (Lindl.) Rchb. f.—In wet ravine, Mt. Ovando, No. 2550.

Goodyera dolabripetala (Ames.) Schltr.—On earth, in wet forest, Mt. Ovando, No. 1806.

Govenia liliacea Lindl.—On earth, in thickets, Motozintla, No. 4863.

Govenia superba (Llav. & Lex.) Lindl.—On earth, in thickets, Letrero, Siltepec, No. 4365; in wet thickets, Ventanas, Siltepec, No. 4541.

Govenia utriculata Lindl.—On earth, in wet thickets, Siltepec, Nos. 178, 1640.

Habenaria alata Hook.—On earth, in wet field, Siltepec, No. 1679.

Habenaria clypeata Lindl.—On earth, in moist grassy field, Cascada, Siltepec, No. 1740.

Habenaria entomantha Lindl.—On earth, in wet thickets, Finca Juárez, No. 1761; in wet thickets, Nuevo Amatenango, Nos. 4728, 4895.

Habenaria flexuosa Lindl.—On earth, in grassy thickets, Escuintla, No. 376.

Habenaria orcophylla Greenm.—On earth, in grassy thickets, Escuintla, No. 363.

Habenaria pauciflora (Lindl.) Reichenb. f.—In wet grassy field, Santa Elena, Acapetahua, No. 16683.

Habenaria quinqueseta (Michx.) Swartz.—In wet field, Santa Elena, Acapetahua, Nos. 16750, 16757.

Habenaria Tuerckheimii Schltr.—In moist grassy field, Finca Juárez, Escuintla, No. 1760.

- Ionopsis utricularioides* (Sw.) Lindl.—On tree, in open woods, Las Garzas, Acapetahua, No. 2811; in open woods, at 1500 m. alt., Mt. Ovando, No. 18226; in woods, Cruz de Piedra, Acacoyagua, No. 17826.
- Isophilus linearis* (Jacq.) R. Br.—On tree, in open woods, Mt. Malé, No. 4635; in forest, Mt. Ovando, No. 1813; in cloud mixed forest, at 2000 m. alt., Saxchanal, Sierra Madre, No. 17807.
- Laelia glauca* Benth.—In oak woods, Montecristo, No. 1986.
- Leochilus oncidoides* Knowl. & Wultr.—On tree, in forest, Cerro de Laguna, Mapastepec, No. 2034.
- Lepanthes creocharis* Schltr.—On tree, in advanced forest, Mt. Pashtal, No. 1688.
- Lepanthes Schiedeii* Rchb. f.—On tree, in forest, Siltepec, No. 1595.
- Leparis fantastica* Ames & C. Schweinf.—In grassy pineland, Mt. Malé, Nos. 4583, 6026.
- Lockhartia Oerstedii* Reichenb. f.—On tree, in oak woods, Honduras, Siltepec, No. 4369.
- Lycaste aromatica* Lindl.—On tree, in open woods, Unión Juárez, No. Ex.
- Lycaste Skinneri* (Batem.) Lindl.—On tree, in wet forest, near Rodeo, Siltepec, No. 368.
- Malaxis calycina* (Lindl.) Kuntze.—On earth, in forest, Mt. Ovando, No. 373.
- Malaxis Ehrenbergii* (Reichb.) Ox.—On earth, in pine woods, Mt. Malé, No. 4644.
- Malaxis excavata* Lindl.—On earth, in forest, Mt. Ovando, No. 4218.
- Malaxis Parthonii* Morr.—On earth, in wet forest, Mt. Pashtal, No. Ex. in pine woods, Mt. Malé, No. 4671; in forest, Rodeo, Siltepec, No. 4568.
- Malaxis unifolia* Michx.—On earth, in pine woods, Mt. Ovando, No. 4217.
- Maxillaria cucullata* Lindl.—On tree, in forest, Mt. Ovando, Escuintla, No. 380; in forest, Tres Cruces, Sierra Madre, No. 5042.
- Maxillaria dense* Lindl.—On tree, in wet forest, Barranca Honda, Siltepec, No. 4053.
- Maxillaria elatior* Reichenb. f.—In forest, Mt. Ovando, No. 6097.
- Maxillaria Housteana* Reichenb. f.—On tree, in forest, Mt. Ovando, No. 2056.
- Maxillaria ringens* Reichenb. f.—On tree, in Mt. Madre Vieja, near Escuintla, No. 2520.
- Maxillaria variabilis* Batem.—On tree, in wet forest, Mt. Ovando, No. 2072; in advanced forest, Barranca Honda, Siltepec, No. 4090.
- Meiracyllium trinasutum* Reichenb. f.—On tree, on woods, Nuevo Amatenango, No. 4787.
- Mormodes histris* Lindl. & Reichenb.—In dry woods, Mt. Ovando, No. 2578.
- Negeliella purpurea* (Lindl.) L. Williams.—On tree, in oak woods, Honduras, Siltepec, No. 4895; in open oak woods, Tuixcum, Motozintla, No. 5536.
- Odontoglossum grande* Lindl.—On tree, in wet forest, Barranca Honda, Siltepec, No. 4060.
- Odontoglossum laeve* Lindl.—On tree, in forest, Mt. Ovando, No. 2183.
- Odontoglossum elegantum* Reichenb. f.—On trees, in forest, Mt. Ovando, No. 3973; in woods, Barranca Honda, Siltepec, No. 4112; in shady forest, Mt. Pashtal, Sierra Madre, No. 1597.
- Odontoglossum Rosii* Lindl.—On tree, in forest, Tabla, Siltepec, No. 1706.
- Odontoglossum stellatum* Lindl.—On tree, in open forest, Ventana, Siltepec, No. 4551; in woods, Haciendita, Siltepec, No. 1710; in wet woods, at 2800 m. alt., south slope, Vol. Tacaná, No. 2839; in forest, La Grandeza, No. 5601.
- Oncidium cavendishianum* Batem.—On tree, in forest, Finca Suiza, Montecristo, No. 1925; in wet forest, Mt. Ovando, No. 3918.
- Oncidium crista-galli* Reichenb. f.—On tree, in woods, Finca Juárez, Escuintla, No. 1749.
- Oncidium leucophilum* Batem.—On tree, in open woods, Toquián, Siltepec, No. 1783; in woods, Mazapa, No. 4840.
- Oncidium microchium* Batem.—On tree, in dry woods, Mazapa, No. 4850.
- Oncidium oblongatum* Lindl.—On tree, in wet forest, Barranca Honda, Siltepec, No. 4091; in wet woods, Ojode Agua, Escuintla, No. 1869. Local name: "Flor de Mayo."
- Oncidium ornithorhynchum* H.B.K.—On tree, in forest, Mt. Ovando, No. 4019.

- Oncidium pusillum* (L.) Reichenb. f.—In woods, at 300 m. alt., Esperanza, Escuintla, No. 17008.
- Ornithidium densum* Reichenb. f.—On tree, in forest, Mt. Ovando, No. 1805.
- Physosiphon Lindleyi* Rolf.—On tree, in forest, Mt. Ovando, No. 2551; in forest, near Aguas Calientes, Vol. Tacaná, No. 2409.
- Pleurothallis dolichopus* Schlechter.—On tree, in forest, Cerro Boqueron, Motozintla, No. 5407.
- Pleurothallis grobyi* Batum & Lindl.—On tree, in woods, near beach, Paredon, Tonala, No. 16330.
- Pleurothallis marginata* Lindl.—On tree, in open woods, Escuintla, No. 2626.
- Pleurothallis Matudiana* C. Schweinf. Bot. Mus. Leaf. Harv. Univ. 5: 102. 1938.—On tree, in woods, Mt. Ovando, No. 2559; in forest, Siltepec (type locality), No. 1577.
- Pleurothallis pansamala* Schlechter.—On tree, in forest, at 2000 m. alt., north slope, Vol. Tacaná, Nos. 2395, 3991.
- Pleurothallis ophiocephala* Lindl.—On tree, in forest, Mt. Ovando, No. 2083.
- Pleurothallis Pfavii* Reichenb. f.—On tree, in dry forest, Mt. Madre Vieja, No. 2533.
- Pleurothallis Tuerckheimii* Schlechter.—On tree, in wet forest, Haciendita, Escuintla, No. 5991.
- Pleurothallis vitariifolia* Schlechter.—On tree, in dry forest, Mt. Madre Vieja, No. 2532.
- Polystachya cerea* Lindl.—In pine woods, at 1800 m. alt., Mt. Ovando, No. 18225.
- Polystachya minor* Fawcett & Rendl.—On tree trunk, in wet forest, Finca Suiza, Montecristo, No. 2050.
- Ponthieva ephippium* Reichb. f.—On earth, in pine woods, Mt. Malé, N. 4623.
- Ponthieva Tuerckheimii* Schlechter.—On earth, in forest, at 3000 m. alt., north slope, Vol. Tacaná, No. 2398.
- Sarcoglottis hemichrea* (Lindl.) Ames.—On rock, in woods, Cintalapa, Escuintla, No. 1085; at 1000 m. alt., on wet rock, in pine woods, Mt. Ovando, No. 16209.
- Sarcoglottis pauciflora* (Rich. & Gal.) Schlechter.—In grassy pineland, Montecristo, No. 2052.
- Scaphyglottis livida* (Lindl.) Schlechter.—On tree, in forest, Finca Suiza, Montecristo, No. 1918.
- Sobralia fragrans* Lindl.—On log, in open woods, near Jilguero, Turquia, Escuintla, No. 17034.
- Sobralia macrantha* Lindl.—On rock, on wet ridge, Nuevo Amatenango, No. 4770; on rocky ridge, Cerro Boqueron, No. 5338.
- Spiranthes aurantiaca* (Llave & Lex.) Hemsl.—On earth, in wet field, Cascada, Siltepec, No. 1639; in wet grassy field, Rodeo, Siltepec, No. 4574.
- Spiranthes alata* (Sw.) L.C. Rich.—On earth, in woods, Finca Suiza, Montecristo, No. 2051; in pine woods, Mt. Ovando, No. 2084.
- Spiranthes guyanensis* (Lindl.) Cogn.—In pine woods, Montecristo, No. 5998; in grassy mixed woods, Chicomuselo, No. 4463.
- Spiranthes tenuifolia* Greenm.—On shady rock, Siltepec, No. 2611.
- Spiranthes violacea* A. Rich. & Gal.—On earth, in pine woods, Mt. Ovando, No. 2098.
- Stelis hymenantha* Schlechter.—On tree, in forest, Mt. Pashtal, No. 1649; in forest, Vol. Tacaná, No. 2389.
- Stelis ovalitabia* Schlechter.—On tree, in forest, Saxchanal, Sierra Madre, No. 4320; in forest, Cerro Boqueron, No. 5365.
- Stelis purpurascens* A. Rich. & Gal.—On tree, in forest, Mt. Pashtal, No. 1646; in forest, Vol. Tacaná, No. 2388; in forest, Mt. Ovando, No. 3972.
- Stelis tenuissima* Schlechter.—On tree, in wet forest, Mt. Ovando, No. 2588; in wet forest, Saxchanal, Sierra Madre, No. 4313.
- Stenorrhynchus speciosus* (Jacq.) L. C. Rich.—On tree, in forest, Siltepec, No. 1635.
- Trichopilia tortilis* Lindl.—On tree, in wet forest, Mt. Ovando, No. 1815.
- Trigenidium Egertonianum* Batem.—On tree, in dry woods, Esperanza, Escuintla, No. 2112.
- Triphora mexicana* (S. Watt.) Schlechter.—On earth, in wet forest, Mt. Ovando, No.

2541; in wet woods, Mt. Pashtal, No. 1729; in forest, La Grada, Escuintla, No. 16808.

Vanilla Pfaviana Reichenb. f.—In forest, Triunfo, Escuintla, No. 360.

Vanilla fragrans (Salisb.) Ames.—In wet forest of Mt. Ovando, near Col. Cacao, at 200-600 m. alt. No. extra. 7.

Addenda

MELIACEAE

Trichilia chiapensis Matuda, Anal. Inst. Biol. Méx. XIX-2: 414. 1948.—In sandy bushy area near Acacoyagua, No. 16438; along the side of Cintalapa River, in sandy thickets, near Escuintla, Nos. 627, 16498; in sandy sunny bushy area, Paderón, 20 km. west of Tonalá, No. 16341. Local name "Mapahuite Simarrón."

APOCYNACEAE

Aspidosperma chiapensis f. *tenax* Matuda.—In wet forest, at 160 m. alt., Esperanza, Escuintla, No. 17386; in same region, No. 18413.

Cufodontia escuintlensis Matuda.—In wet forest at 150 m. alt., Cacaluta, Acacoyagua, No. 16978; in wet forest at 200 m. alt., Esperanza, Escuintla, No. 17538.

ARACEAE

Anthurium cuspidatum Matuda, Madroño 10: 169. 1950.—In shaded forest at 700 m. alt. Col. Jalapa, 32 km. east of Escuintla, No. 18316; in advanced forest, at 1800 m. alt., Pacific slope of Sierra Madre, No. 18159.

Anthurium huixtlense Matuda.—On wet rock in shaded forest, at 900 m. alt. near Piedra de Huixtla, 16 km. northeast of Huixtla, No. 18615.

Anthurium xanthosomifolium Matuda.—On wet rock, in margin of shaded woods, at 900 m. alt., Cascada, Siltepec, No. 18644; at Ojo de Agua, near Cerro Saxchanal, at alt. 1700 m. No. 18628; in Finca Gloria, at 900 m. alt., 24 km. northeast of Escuintla, No. 18620.

Dracontium soconuscum Matuda, Amer. Midl. Nat. 41: 47. 1949.—In lowland thickets, Santa Elena, 14 km. west of Acapetahua, No. 17780. Local name "Cola de Tigre." Genus new to Mexican flora.

Monstera chiapensis Matuda, Madroño 10: 48. 1949.—In advanced tropical forest, near Finca California, alt 150 m. east of Escuintla, No. 17789; in wet forest, Finca Esperanza, at 200 m. alt., 8 km. northeast of Escuintla, No. 17786.

Monstera siltepecana Matuda.—In wet valley of Naranjo River, at 1200 m. alt. Cascada, Siltepec, No. 18642.

Philodendron apocarpum Matuda, Madroño 10: 171. 1950.—In woods at Gilguero, along the side of Cintalapa River at 200 m. alt., 15 km. east of Escuintla, No. 18313. In open woods on brookside, Salto de Agua, Escuintla, No. 17798; in Aguas Calientes, near Escuintla, No. 18312; in Esperanza, Escuintla, No. 17789.

Philodendron escuintlense Matuda, Madroño 10: 51. 1949.—In wet forest, at 500 m. alt., Salto de Agua, 16 km. east of Escuintla, No. 17783; in advanced forest, at 350 m. alt., Gilguero, 20 km. northeast of Escuintla, No. 17784.

Philodendron monticola Matuda, Madroño 10: 170. 1950.—On large tree, in advanced forest at 1600 m. alt. Col. San Juan, 50 km. east of Escuintla, No. 18169.

Syngonium chiapensis Matuda.—In shaded woods at 900 m. alt., near Piedra de Huixtla, 24 km. northeast of Huixtla, No. 18619. In advanced forest at 900 m. alt., in Finca Córcega, northeast of Pueblo Nuevo Comalatlán, No. 18423.

Notes on the Illinois Flora*

Robert A. Evers

Illinois State Natural History Survey, Urbana

These notes on the Illinois flora are based principally on observations made in my field work of the past three summers during which time I collected over 20,000 specimens and visited every county in Illinois three or more times. They are to a lesser extent based on a study of some specimens in the herbarium of the Illinois State Natural History Survey.

The plants named in this paper fall into three groups: (1) species not previously recorded for Illinois, (2) species of restricted distribution but for which additional locality records are here reported, and (3) species for which locality records are now available for the first time for every county in the state. Unless otherwise indicated, all cited specimens are in the herbarium of the Illinois State Natural History Survey.

I. SPECIES NOT PREVIOUSLY REPORTED FOR ILLINOIS

Daucus pusillus Michx.—This species of wild carrot occurs from South Carolina and Florida, westward to Idaho, British Columbia and California; also in Mexico and South America (Rydberg, 1932). In Missouri it occurs throughout the western part of the state and locally in two other counties (Steyermark, 1940). I have collected it once in Illinois.

PERRY CO.: Woodland border northwest of Pinckneyville, June 23, 1949, R. A. Evers 17942.

Medicago arabica Huds.—The Spotted Medic, represented in the Survey's collections by only one specimen, is probably a waif. Mr. G. H. Boewe stated that he has not seen it since the time he first collected it, nor have I found additional plants.

JACKSON CO.: In Trobaugh's peach orchard, west of Carbondale, May 15, 1940 (as *M. hispida*), G. H. Boewe.

II. ADDITIONAL LOCALITY RECORDS

Lycopodium lucidulum Michx.—Tryon *et al.* (1940) gave the distribution of this clubmoss as Newfoundland to Alabama, west to Minnesota and Missouri. G. N. Jones (1947b) stated that it is rare in Illinois and cited specimens from four counties. The southernmost locality in G. N. Jones' enumeration is Clark County, represented by a specimen collected by E. L. Stover in 1944. Two more localities may now be added, localities that are about a hundred miles south of the Clark County site.

* Received for publication October 25, 1949.

JACKSON CO.: Sandstone cliffs, Grand Canyon southwest of Murphysboro, May 30, 1949, R. A. Evers 16800. POPE CO.: Sandstone cliff, Bell Smith Springs southeast of McCormick, April 15, 1949, R. A. Evers 15817.

Taxus canadensis Marsh.—G. N. Jones (1945) reported Canada Yew from Jo Daviess, Winnebago, Ogle, Carroll, Lee, La Salle, and Kankakee counties. Tehon (1942) included also Lake and Cook counties but qualified his distribution by also stating "certain records, for example in Cook and Carroll counties, are apparently based on cultivated specimens." I have not found it in my visits during the last three years to the tamarack bogs (Volo, Antioch, Wauconda, Cedar Lake) of Lake County, and I have not visited the Cook County locality. However, it is native in Carroll County, growing along the rock outcrops and rock ledges along Carroll Creek at Smith Park which is approximately 2 miles west of Mount Carroll. In Stephenson County I found the plant in similar situations.

CARROLL CO.: Smith Park, Mount Carroll, September, 1933, L. E. Sawyer; Rock ledges, Smith Park west of Mount Carroll, June 6, 1949, R. A. Evers & J. W. Hall 17178. STEPHENSON CO.: Rock ledges along Yellow Creek, 2 miles southwest of Freeport, August 5, 1949, R. A. Evers 19358; rock ledges along Cedar Creek north of Cedarville, August 5, 1949, R. A. Evers 19274.

Sisyrinchium campestre Bickn.—The distribution of this blue-eyed grass is from Manitoba southward into Wisconsin, Missouri, and Louisiana, westward to New Mexico and North Dakota (Britton and Brown, 1913; Robinson and Fernald, 1908; Rydberg, 1932). It occurs throughout Missouri (Steyermark, 1940) but not in Indiana (Deam, 1940). Bicknell (1899) listed it from Menard County, Illinois. Except Jones 11234, the following records represent specimens in the Natural History Survey herbarium.

CARROLL CO.: In sandy soil south of Savanna, May 16, 1948, R. A. Evers 9599. GREENE CO.: Roadside at East Hardin, June 3, 1947, R. A. Evers 3792. HENRY CO.: Open grassy situations, Oakwood Cemetery, May 18, 1937, R. J. Dobbs. MASON CO.: Sandy bank near Havana, May 11, 1940, G. N. Jones 11234 (ILL). OGLE CO.: Wooded bluffs at Devil's Backbone south of Oregon, May 14, 1948, R. A. Evers 9411. STEPHENSON CO.: Along the railroad 1 mile west of Waddams Grove, May 15, 1948, R. A. Evers 9520. WHITESIDE CO.: In sandy soil north of Fulton, May 16, 1948, R. A. Evers 9610.

Quercus lyrata Walt.—The Overcup Oak, represented in the Survey's collections by specimens from along the Mississippi River northward to Calhoun County, has a northward range to Adams County.

ADAMS CO.: Quincy, at water's edge at north end of Goose Lake, May 10, 1941, R. A. Evers 306 (Determined by E. J. Palmer); shores of Goose Lake north of Quincy, September 25, 1948, R. A. Evers 15217, 15221 (in fruit).

Quercus montana Willd.—Miller and Tehon (1929) reported the Chestnut Oak from Atwood Ridge in Union County. Since that time, the exact locality has been lost, especially as no specimens appear extant in midwest herbaria. In 1948, R. S. Dimmick, District Ranger, U. S. Forest Service,

Jonesboro, relocated this oak and Dr. W. M. Bailey of Southern Illinois University and Mr. D. Hankla collected specimens on October 9, 1948, Mr. Dimmick serving as their guide. On October 16, 1948, Mr. Dimmick and I visited the site and collected samples. On May 29, 1949, Mr. Dimmick informed me that he saw Chestnut Oak in Alexander County, and, following his directions, I located the trees and collected specimens.

ALEXANDER CO.: On a wooded ridge northwest of Tamms, May 29, 1949, R. A. Evers 16709, 16713, 16715; July 16, 1949, R. A. Evers 18685. UNION CO.: Open woods, upper slope of a very high hill, Atwood Ridge, southwest of Jonesboro, October 9, 1948, W. M. Bailey & D. Hankla; wooded slopes of Atwood Ridge, southwest of Jonesboro, October 16, 1948, R. A. Evers & R. S. Dimmick 15620.

Brunnichia cirrhosa Gaertn.—G. N. Jones (1945) reported this plant as rare. Herbarium material is not abundant, but field studies show the species to be prevalent in bottomland areas in Johnson, Massac, and Pulaski counties. The plant tends to climb over all of the surrounding vegetation, especially that growing along the county highways.

JOHNSON CO.: Vienna quadrangle, R2E, T13S, between Belknap and Karnak on the Big Four Railroad Tracks, in low woods, July 28, 1931, J. Schopf 902; south of Cypress, October 3, 1948, R. A. Evers 15559.

Acalypha ostryaefolia Ridd.—An additional record may be added to those made by Fuller & Jones (1949).

UNION CO.: Edge of a field at the base of Atwood Ridge, southwest of Jonesboro, October 16, 1948, R. A. Evers 15617.

Mentzelia oligosperma Nutt.—The Few-seeded *Mentzelia*, reported by Mead (1846), Lapham (1857), Patterson (1876), and Brendel (1887) still grows in Illinois. I have found it in two localities.

MONROE CO.: Hill prairie south of Valmeyer, September 2, 1949, R. A. Evers 20500. PIKE CO.: Rock ledge at the base of a hill prairie south of Kinderhook, September 7, 1949, R. A. Evers 20828; hill prairie south of Kinderhook, September 7, 1949, R. A. Evers 20841.

Callirhoe triangulata (Leavenw.) A. Gray.—This species is locally abundant in some of the sand areas of the state, especially those in Mason County. The following records represent specimens in the Survey herbarium.

CASS CO.: Sandy soil at edge of a timber $5\frac{1}{2}$ miles south of Beardstown, June 27, 1941, G. H. Boewe; woods south of Beardstown, September 13, 1947, R. A. Evers & J. W. Hall 7657. HENRY CO.: Sand prairie in northeastern Henry County, July 19, 1944, L. R. Tehon. JO DAVIESS CO.: Sand area south of Blanding, August 26, 1948, R. A. Evers 13812. KANKAKEE CO.: Near Heiland Lodge and golf course, east of Kankakee, August 5, 1938, Mr. Conard. MASON CO.: In sandy soil east and north of Havana, July 20, 1938, G. H. Boewe; in sandy woods east of Havana, September 6, 1947, R. A. Evers & M. F. Moseley 7319; White Oak Creek south of Havana, July 11, 1948, R. A. Evers 11643; August 18, 1948, R. A. Evers 13072; in sand along the roadside west of Kilbourne, August 1, 1949, R. A. Evers 18941.

Helenium tenuifolium Nutt.—Recent field studies show that this sneezeweed is often abundant in pastures, along roadside ditches, and on waste ground in the southern part of the state. In Randolph County, near Roots,

it covered in 1948 approximately an acre of a field, and in Johnson and Massac counties it was abundant in some pastures.

ALEXANDER CO.: Olive Branch, September 27, 1931, *Pepoon & Barrett*; roadside at Sandusky, July 16, 1949, *R. A. Evers* 18703. HARDIN CO.: Pasture north of Cave-In-Rock, August 26, 1949, *R. A. Evers* 20037. JOHNSON CO.: South and west of Grantsburg, July 18, 1931, *J. Schopf* 7255; in a pasture south of Vienna, August 22, 1948, *R. A. Evers* 13350; abundant in a pasture north of Buncombe, October 3, 1948, *R. A. Evers* 15565. MASSAC CO.: Abundant in a pasture west of Unionville, August 22, 1948, *R. A. Evers* 13408; abundant in a pasture northwest of Joppa, August 25, 1949, *R. A. Evers* 19958. PIKE CO.: In bottom pasture just west of Pearl, August 25, 1938, *G. H. Boewe*. POPE CO.: Abundant in a pasture east of Dixon Springs, August 25, 1949, *R. A. Evers* 20021; abundant in a pasture 3 miles northeast of Golconda, August 26, 1949, *R. A. Evers* 20025. PULASKI CO.: Lowland pasture 2 miles southwest of Olmsted, August 6, 1942, *G. H. Boewe*; in a field near Pulaski, August 25, 1949, *R. A. Evers* 19985. RANDOLPH CO.: Abundant in a field near Roots, July 23, 1948, *R. A. Evers* 12304. SALINE CO.: Roads and fields near Harrisburg, September 3, 1932, *G. H. Boewe*. UNION CO.: Roadside west of Jonesboro, July 16, 1949, *R. A. Evers* 18677; abundant in a pasture east of Anna, August 25, 1949, *R. A. Evers* 20009. WASHINGTON CO.: Barn lot 5 miles west of Ashley, September 10, 1940, *G. H. Boewe*. WAYNE CO.: Abundant in a pasture east of Fairfield, August 27, 1949, *R. A. Evers* 20164.

Centaurea maculosa Lam.—G. N. Jones (1947a) reported this plant from Boone County. The following county records can be added:

HENRY CO.: Six or seven miles northeast of Geneseo, October 8, 1935, *R. J. Dobbs*. WINNEBAGO CO.: Along roadsides and in fields about 4 miles east of Rockford, July 18, 1939, *G. H. Boewe*.

III. PLANTS COLLECTED FROM EVERY COUNTY IN ILLINOIS

The very common plants are frequently not collected and thus herbaria present poor records of their distribution. During the past three summers, I have attempted to collect a number of the common species from every county in the state. I have completed collections of the following plants from every county in Illinois.

Echinochloa crusgalli L.
Melilotus alba Desr.
Melilotus officinalis (L.) Lam.
Trifolium hybridum L.
Trifolium pratense L.
Trifolium repens L.
Euphorbia corollata L.

Rhus glabra L.
Rhus radicans L.
Achillea millefolium L.
Ambrosia trifida L.
Ambrosia elatior L.
Erigeron canadensis L.
Lactuca scariola L.

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Studies in Florida Botany*

8. The Genus *Habenaria* in Florida

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Genus *Habenaria* was originally established by Willdenow, in 1805 (SPEC. PL. 4: 44). Today it is one of the largest of all orchid aggregations, with perhaps eight hundred species known, distributed all over the terrestrial globe, from the near-Arctic regions to the humid tropics of the Equatorial belt.

It is the second largest genus in the orchid flora of Florida, being exceeded in indigenous members only by the complex *Spiranthes* L. C. Rich., which has sixteen species and varieties occurring within our area. *Habenaria* consists of twelve known Floridian native forms to this date.

As in the other large generic aggregations in Florida, we find, unfortunately, that the members of *Habenaria* occurring within the confines of this state are still incompletely known, and, in several instances, their exact taxonomic limitations are not understood. This study, therefore, is not to be taken as a monographic treatment of this group in Florida, but rather as a contribution toward our knowledge of these interesting orchids in the native flora.

KEY TO THE FLORIDA HABENARIA SPECIES

- I. Lip usually divided into three segments; petals generally divided; stigmatic processes conspicuous.
 - a. Lip slightly lobed; flowers greenish-yellow, fragrant12. *H. strictissima* var. *odontopetala*
 - a. Lip strongly 3-lobed.
 1. Leaves all basal; flowers greenish6. *H. distans*
 1. Leaves not all basal.
 - a. Leaves much longer than broad; flowers yellow-green11. *H. repens*
 - a. Leaves about as long as broad; flowers white, fragrant10. *H. quinqueseta*
- II. Lip never divided; petals not divided; stigmatic processes lacking or very small and inconspicuous.
 - a. Lip fringed.
 1. Flowers white1. *H. blephariglottis*
 1. Flowers yellow or orange.
 - a. Lip fringed all around edge.
 - b. Lip 9 mm long; spur 5-9 mm long5. *H. cristata*
 - b. Lip 1 cm long; spur 2-2.5 cm long3. *H. ciliaris*
 - a. Lip fringed only at apex; hybrid between *H. ciliaris* and *H. cristata*2. x*H. Chapmanii*
 - a. Lip not fringed.
 1. Flowers white or yellow.
 - a. Flowers white9. *H. nivea*

* Previous parts of this serial have appeared or are appearing in *Lloydia* and *Phytologia*.

- a. Flowers yellow 8. *H. integra*
- 1. Flowers green or greenish.
 - a. Lip toothed at apex; flowers greenish 4. *H. clavellata*
 - a. Lip not toothed at apex; flowers green 7. *H. flava*

1. *HABENARIA BLEPHARIGLOTTIS* (Willd.) Hook. Exot. Fl. 2 (1824) t. 87.

Orchis blephariglottis Willd. Sp. Plant. 4 (1805) 9. *Platanthera blephariglottis* Ldl. Gen. & Sp. Orch. Pl. (1835) 291. *Platanthera holopetala* Ldl., l.c. *Blephariglottis albiflora* Raf. Fl. Tellur. 2 (1837) 38. *Platanthera blephariglottis* var. *holopetala* Torr. Fl. State N.Y., 2 (1843) 277. *Platanthera ciliaris* var. *blephariglottis* Chapm. Fl. S. U.S., ed. 1 (1860) 460. *Habenaria blephariglottis* var. *holopetala* A. Gray, Man. Bot. N. U.S., ed. 5 (1867) 502. *Habenaria ciliaris* var. *alba* Morong in Bull. Torr. Bot. Club 20 (1893) 38. *Habenaria ciliaris* var. *holopetala* Morong, l.c. *Blephariglottis blephariglottis* Rydbg. in Britt. Man. Fl. N. States & Can., ed. 1 (1901) 296. *Blephariglottis blephariglottis* var. *holopetala* Rydbg., l.c. *Habenaria holopetala* Niles Bog-trotting for Orch. (1904) 256. *Blephariglottis alba* House in Muhlenbergia 1 (1906) 127.

Roots several, rather fleshy, subterranean. Stems large, erect, leafy, to 1 m high, slender, with several leaves, mostly basal. Leaves to 12 cm long, 5 cm wide at base, lanceolate or linear-oblong, acute. Spike variable, 2-12 cm long, up to twenty-flowered. Flowers large, showy, pure white, long-lived, fragrant part of the day, 2 cm in diameter, becoming brownish with age. Sepals about 7 mm long, roundish or orbicular-ovate, obtuse. Petals somewhat connivent with dorsal sepal, narrowly oblong or rather spatulate, smaller than sepals, toothed or slightly fringed near tip. Lip oblong or ligulate, considerably narrower than petals, to 8 mm long, with a fringe which varies in density at apex. Spur awl-shaped, about 2.5 cm long, exceeding the ovary, pendent behind the flower. Capsule about 1 cm long.

Peninsular Florida, rarer toward southern portion, frequent to common northward. Also in the Eastern U.S. and Canada from Newfoundland southward, and west to Mississippi. Flowers in the summer months.

2. *X HABENARIA CHAPMANII* (Small) Ames Orch. 4 (1910) 155
(*H. ciliaris* X *H. cristata*).

Blephariglottis Chapmanii Small Fl. S.E. U.S., ed. 1 (1903) 314.

Natural hybrid between *H. ciliaris* and *H. cristata*. Plants resembling *H. ciliaris*. Roots thick, clustered. Stem erect, leafy, to 12 dm high occasionally. Leaves few, mostly somewhat basal, linear or linear-lanceolate, acute, about 20 cm long, 5 cm broad, gradually smaller toward floral-bearing portion, there changing to sessile, rather prominent bracts, rather clasping toward base of stem. Raceme dense, many-flowered, about 12 cm or more long, 4 cm in diameter. Flowers bright orange, rather intermediate between parents, easily distinguished from them by apically fringed lip, whereas parents have fringe all around labellum. Sepals about 4.5 mm long, 1.7 mm broad, occasionally emarginate, suborbicular in the laterals, concave in the dorsal. Petals about 4 mm long, rather fringed generally, spreading. Lip fringed apically, 12 mm long, linear, with a branching appendage on each side near base. Spur slender, about as long as ovary, protruding behind the labellum.

Northern and central peninsula Florida, rather localized and sporadic. Also in Georgia and North Carolina. Flowers in the fall.

3. *HABENARIA CILIARIS* (L.) R.Br. in Ait. Hort. Kew., ed. 2, 5 (1813) 194.

Orchis ciliaris L. Sp. Plant. ed. 1, 2 (1753) 939, excl. Gronov. Fl. Virg. cit. *Platanthere ciliaris* Ldl. Gen. & Sp. Orch. Pl. (1835) 292. *Blephariglottis flaviflora* Raf. Fl. Tellur. 2 (1837) 39. *Blephariglottis ciliaris* Rydbg. in Britt. Man. Fl. N. States & Can., ed. 1 (1901) 296.

Roots several, fibrous, two or three of them tuberous. Stem erect, slender, up to 80 cm high. Leaves on lower part of stem mostly, to 20 cm long and 4 cm wide, oblong or lanceolate, acute, gradually smaller and more bract-like upwards. Flower-spike to 15 cm long, about 8 cm in diameter, rather numerous-flowered. Blossoms brilliant orange or orange-yellow, about 2 cm across, becoming brown with age. Dorsal sepal convex, thrust forward over the column and lip with the petals to form a galea, orbiculate or obovate, entire, oblique basally, about 8 mm long, 3 mm wide. Laterals similar, reflexed at sides of column. Petals generally toothed near apex, considerably smaller than sepals, oblong, somewhat cuneate, or linear, connate into a galea with dorsal sepal. Lip to about 1.5 cm long, fringed densely all around margin (occasionally lacking in basal fringe), oblong, thrust forward at an angle. Spur very slender, to 2.5 cm long. Capsule beaked, to about 1.5 cm long.

Common in central and northern Florida, rarer south, usually in meadows and moist fields. Also from Ontario and Vermont west to Michigan and Texas. Flowers in the summer, especially in August.

4. *HABENARIA CLAVELLATA* (Michx.) Spreng. Syst. Veg. 3 (1826) 689.

Orchis clavellata Michx. Fl. Bor.-Amer. 2 (1803) 155, excl. syn. in part. *Orchis tridentata* Muhl. ex Willd. Sp. Plant. 4 (1805) 41. *Orchis clavellata* β *tridentata* Muhl. Cat. Plant. Amer. Septentr. (1813) 80, nomen. *Habenaria tridentata* Hook. Exot. Fl. 2 (1824) t. 81. *Gymnadenia tridentata* Ldl. Gen. & Sp. Orch. Pl. (1835) 277. *Gymnadenia tridentata* β *clavellata* Wood Class-Book Bot. (1861) 683. *Peristylus clavellatus* Krzl. Orch. Gen. et Sp. 1 (1898) 521. *Gymnadeniopsis clavellata* Rydbg. in Britt. Man. Fl. N. States & Can., ed. 1 (1901) 293.

Roots several, thick, clustered. Stem erect, somewhat angular, to about 5 dm tall, with a few-flowered spike at apex. Leaves several, usually one at base and several more or less bracteose ones above; lower leaf oblong or oblanceolate, obtuse or acutish, yellowish-green, to 15 cm long; upper leaves similar in shape, reduced in size. Spike about 7 cm. long. Flowers rather small, long-lasting, greenish or whitish, usually with a cream-colored lip. Sepals and petals ovate, about 3 mm long, rather obtuse apically. Lip spatulate or cuneate-oblong, about 4 mm long, with three often obscure teeth at apex. Spur clavate, about as long as labellum, pendent behind it. Capsule ovoid or oblong, almost erect on maturity, about 9 mm long.

Rather infrequent in northern and central peninsular Florida. Also from Newfoundland west to Minnesota and south to Arkansas and Louisiana. Flowers in the summer.

5. *HABENARIA CRISTATA* (Michx.) R.Br. in Ait. Hort. Kew., ed. 2, 5 (1813) 194.

Orchis cristata Michx. Fl. Bor.-Amer. 2 (1803) 156. *Platanthera cristata* Ldl. Gen. & Sp. Orch. Pl. (1835) 291. *Blephariglotis cristata* Raf. Fl. Tellur. 2 (1837) 39.

Roots of two types: two or three very thick tuberous ones, and several additional fibrous ones. Stem erect, to 6 dm high. Leaves mostly basal, gradually becoming bracteose above, narrowly lanceolate to linear, acuminate, to 25 cm long, 2 cm wide, considerably smaller toward spike. Floral-bracts numerous, lanceolate, acuminate, as long as flowers, toward base enlarging. Spike apical, dense, to 12 cm long and a diameter of 4 cm basally. Flowers bright orange or orange-yellow, almost 1 cm in diameter, rather long-lived. Sepals about 4 mm long, orbicular-ovate, the laterals more widely spreading than convex dorsal, which forms a small galea with petals. Petals considerably narrower than sepals, variously pectinate-fringed. Lip simple, to 9 mm long, deeply fringed all around the margin, the fringe being as long as the lamina or slightly longer. Spur slim, about half as long as ovary (to 7 mm long), borne behind the flower. Capsule about 1 cm long.

Central and south-central peninsular Florida, where it is frequent to common. Also north to Massachusetts, and west to Louisiana and Arkansas. Flowers in the summer months, particularly July.

6. *HABENARIA DISTANS* Griseb. Cat. Plant. Cub. (1866) 270.

Roots usually thickened into one or two tubers. Leaves grouped, several, basal, usually prostrate on ground, rather flaccid and membranous, lanceolate-ovate or oblong, acute, about 16 cm long, 5 cm broad. Scape erect, with several leafy bracts to 2 cm long, which are ovate-lanceolate and more or less acuminate. Raceme few-flowered, lax, with acuminate bracts subtending blossoms which are as long or longer than ovaries. Dorsal sepals ovate-oblong, obtuse trinervose, about 6 mm long or more, 4 mm wide, frequently with a small apiculate appendage at apex. Lateral sepals deflexed, oblong, trinervose, mucronate, obtuse or acutish, usually slightly smaller than dorsal, but longer. Petals two-parted, both segments of which are approximately the same size; the posterior is linear-ligulate or ligulate, somewhat arcuate, about as long as dorsal sepal; anterior portion slightly longer and filiform. Lip pendent, about 8 mm long, deeply trilobate, with a linear, obtuse midlobe about 8 mm long and 1 mm wide, and usually longer filiform lateral lobes which are widely spreading at sides of midlobe. Spur pendulous, arcuate, somewhat clavate, about 2 cm long, acute at tip. Capsule ellipsoidal, angled, somewhat cylindrical, to 1.5 cm long.

An extreme rarity in southwest Florida. Also in Cuba, Jamaica, Hispaniola, and Puerto Rico. Flowers in the fall.

7. *HABENARIA FLAVA* (L.) R.Br. ex Spreng. Syst. Veg. 3 (1826) 691.

Orchis flava L. Sp. Plant., ed. 1, 2 (1753) 942. *Orchis virescens* Muhl. ex Willd. Sp. Plant. 4 (1805) 37. *Satyrium virescens* Pers. Syn. Plant. 2 (1807) 507. *Habenaria herbiola* R.Br. in Ait. Hort. Kew., ed. 2, 5 (1813) 193. *Orchis flava* var. *virescens* Green

in Trans. Soc. Prom. Useful Arts 3 (1814) 120, nomen. *Orchis fuscescens* Pursh, Fl. Amer. Septentr. 2 (1814) 587, nec L., nec Gmel. *Orchis herbiola* Pursh, l.c., suppl. 743. *Orchis bidentata* Elliott, Sketch Bot. S.C. & Ga. 2 (1823) 488. *Habenaria virescens* Spreng. Syst. Veg. 3 (1826) 688. *Habenaria fuscescens* Torr. Compend. Fl. N. and Mid. States (1826) 318. *Orchis scutellata* Nutt. in Trans. Amer. Phil. Soc., n.s., 5 (1834) 161. *Platanthera herbiola* Ldl. Gen. & Sp. Orch. Pl. (1835) 287. *Platanthera flava* Ldl., l.c., 293. *Platanthera fuscescens* Krzl. Orch. Gen. et Sp. 1 (1899) 637. *Peristylus virescens* Ldl. Gen. & Sp. Orch. Pl. (1835) 298. *Perularia virescens* A. Gray in Bot. Gaz. 5 (1880) 63. *Perularia flava* Farwell in 11th Ann. Rept. Comm. Parks & Boul. Detroit (1900) 54. *Perularia bidentata* Small, Fl. S.E. U.S., ed. 2 (1913) 314. *Perularia scutellata* Small, l.c. *Habenaria flava* var. *virescens* Fern. in Rhodora 23 (1921) 14b, in footnote.

Roots clustered, fibrous, somewhat fleshy, usually rather elongate. Stem erect, leafy, to 65 cm high. Leaves extending almost to base of raceme, gradually becoming smaller above, narrowed basally, oblong, elliptic or lanceolate, acute or acutish, to 30 cm long and 8 cm wide. Floral bracts longer than flowers, narrow, linear-lanceolate, acuminate. Raceme erect, to 16 cm long. Flowers numerous, small, greenish or yellow-green. Sepals generally ovate or round-ovate, obtuse, with the laterals more or less spreading. Petals often brighter green than sepals, somewhat crisped, similar in shape to sepals, but slightly shorter. Lip somewhat longer than petals, more or less entire, occasionally crenulate, broadly oblong, with a small obtuse lobule on each side of base, and a central obtuse conical projection in the middle. Spur long, sac-like, to 1 cm long, obtuse, pendent behind lip. Capsule oblong, about 11 mm long.

Northern and central peninsular Florida, where it is occasional. Also from Nova Scotia and Ontario south to Texas. Flowers throughout spring and summer.

8. HABENARIA INTEGRAL (Nutt.) Spreng. Syst. Veg. 3 (1826) 689.

Orchis integra Nutt. Gen. N. Amer. Pl. 2 (1818) 188. *Platanthera integra* Gray ex Beck Bot. U.S. North of Va., ed. 2 (1848) 348. *Gymnadeniopsis integra* Rydbg. in Britt. Man. Fl. North. States & Can., ed. 1 (1901) 293.

Roots several, thickened, often tuberous. Stem erect, to 6 dm high, leafy basally. Leaves mostly at base, one or two, alternate, rather fleshy, linear-lanceolate or broadly linear, acute or acutish, with several depressed veins, usually under 15 cm long. Bracts more or less foliose; floral bracts as long as ovaries. Spike oblong or conical, to 9 cm long, very dense. Flowers numerous, orange to orange-yellow, about 4 mm in diameter. Dorsal sepal connivent with petals, concave, orbicular-ovate to ovate, obtuse, about 4 mm. long. Lateral sepals spreading, concave, oval or obovate, somewhat longer than dorsal. Petals often somewhat larger than sepals, about 4 mm long, with introrse apices, often touching under arcuate dorsal sepal. Lip about 4 mm long, oblong to ovate, slightly crenulate marginally, somewhat turned downward at apex. Spur slender, straight, longer than lip, somewhat shorter than ovary.

Northern and central peninsular Florida, rarer southward, mostly in wet fields or pinelands. Also from New Jersey west to Tennessee and Texas. Flowers in summer.

9. *HABENARIA NIVEA* (Nutt.) Spreng. Syst. Veg. 3 (1826) 639.

Orchis nivea Nutt. Gen. N.Amer. Pls. 2 (1818) 188. *Gymnadenia conica* Ldl. Gen. & Sp. Orch. Pl. (1835) 280. *Gymnadenia nivea* Ldl., l.c. *Peristylus niveus* Krzl. Orch. Gen. et Sp. 1 (1898) 520. *Gymnadeniopsis nivea* Rydbg. in Brit. Man. Fl. North. States & Can., ed. 1 (1901) 293.

Tuber single, elliptic-ovoid, surrounded by several thickened roots. Stem to 40 cm high, leafy basally. Leaves two or three at base, linear-lanceolate, acuminate, conduplicate, rather fleshy, to 25 cm long and 1.5 cm broad, becoming bracteose above. Floral bracts lanceolate, acuminate, 1-2.5 cm long. Spike many-flowered, about 8 cm long, dense. Flowers deliciously fragrant, numerous, pure glistening white, about 1.5 cm in diameter, inverted, with the lip uppermost, gradually turn brownish with age. Dorsal sepal oval to oblong, about 4 mm long, rounded apically. Lateral sepals spreading, similar in size to dorsal, concave, rather falcate, definitely lobed on upper margin, the lobes curving backward to touch behind the lip. Petals somewhat smaller than sepals, about 6 mm long by 1.5 mm wide, curved downward so that they approximate the dorsal sepal in position. Lip linear-ligulate, 5-7 mm long, revolute apically, supported below by sepaline lobes behind it. Spur slender, curved, to 1.4 cm long, with a decided crook in it near apex. Capsule sessile, conical-fusiform, about 8 mm long.

Peninsular Florida, rarer south. Also on the Eastern Seaboard from New Jersey and Delaware to Florida, around the Gulf Coast to Texas and Arkansas; Cuba. Flowers usually in May and June.

10. *HABENARIA QUINQUESETA* (Michx.) Sw. Adnet. Bot. (1829) 46.

Orchis quinqueseta Michx. Fl. Bor.-Amer. 2 (1803) 155. *Habenaria macroceratitis* Willd. Sp. Pl. 4 (1805) 44. *Habenaria Michauxii* Nutt. Gen. N.Amer. Pls. 2 (1818) 189. *Mesicera Michauxii* Raf. Fl. Tellur. 2 (1837) 39. *Platanthera Michauxii* Wood, Class-Book (1861) 685. *Orchis Michauxii* Wood, Amer. Bot. & Flor. (1870) 328. *Habenaria Simpsonii* Small, Fl. S.E. U.S., ed. 1 (1903) 315.

Stem to about 6 dm high, round or somewhat angular, about 5 mm in diameter near base. Leaves borne almost to base of spike, yellow-green in color, somewhat lighter on lower surface, elliptic-lanceolate to suborbicular, mostly acute, conduplicate and embracing stem at base, to 12 cm long, 4 cm wide in middle, gradually becoming foliose bracts above, which are erect, cordate, and incurved at the apex. Spike rather lax, to 28 cm long, bearing fifteen or less flowers. Flowers fragrant, 3.5 cm across tips of lower petal segments, 2 cm long, with apple-green sepals, and snow-white petals and lip. Dorsal sepal connate with posterior segments of petals, usually ovate, obtuse, to 9 mm long. Lateral sepals spreading, strongly deflexed, acutish, ovate or ovate-lanceolate. Petals bipartite, complex, with an erect posterior portion which is oblong, somewhat falcate, about 10 mm long, and a spreading filiform anterior one which is about 18 mm long. Lip trilobate, with a linear midlobe to 12 mm long which has revolute margins, and is somewhat oblong apically; lateral lobes down-curved, filiform, to 20 mm long, rather obtuse at apex.

Spur clavate, somewhat compressed, about twice as long as ovary, greenish-white.

Peninsular Florida, especially common in southern portion, in pinelands. Also from South Carolina west to Texas; Cuba, Jamaica, Mexico. Flowers mostly in late summer and fall.

11. *HABENARIA REPENS* (Raf.) Nutt. Gen. N.Amer. Pl. 2 (1818) 190.

Orchis repens Raf. Neogen. (1825) 4, nomen. *Habenaria tricuspidis* A. Rich. Fl. Cub. 3 (1853) 249. *Platanthera repens* Wood, Class-Book of Bot. (1861) 685. *Habenaria Nuttallii* Small, Fl. S.E. U.S., ed. 1 (1903) 315.

Plant typically partially aquatic, highly variable. Roots copious, long, thick, fibrous, often borne some distance from base of stem. Stem leafy throughout length, varying from 12 to over 70 cm high, thick and robust or spindly and slender. Leaves bracteose basally, 3-4 mm long, gradually enlarging toward middle of stem, where they attain a length of 20 cm and a width of 5 mm, linear-oblong to oblong-lanceolate, acute; upper leaves narrower, smaller. Spike loose or dense, few- to many-flowered, erect. Flowers to 12 mm across, green or yellow-green. Dorsal sepal connate with petals to form a galea, about 5 mm long and 3.5 mm across, almost orbicular in shape, apiculate, concave, enclosing the upper segment of the petals. Lateral sepals slightly longer than dorsal, about 3 mm across, ovate-lanceolate, curving outward from behind labellum, sometimes involute marginally. Petals complex, bipartite, somewhat membranaceous, about 4.5 mm long; posterior segments lanceolate, acute, hidden inside dorsal sepal; anterior segments spreading, somewhat longer than posterior ones, erect, falcate, more or less twisted, almost filiform, acute. Lip trilobed, 7 mm long, sharply deflexed between lateral sepals; midlobe shorter than laterals, linear, acutish; lateral lobes filiform or setaceous, somewhat incurved, almost parallel to midlobe, about 1.5 mm longer. Spur to 14 mm long, filiform, usually not twisted, about equalling pedicellate ovary in length.

Aquatic in ponds or sluggish streams, growing in water-weeds near shore, or terrestrial in pinelands and hammocks, peninsular Florida. Also in adjacent southeastern United States, West Indies, Central America, and South America to Venezuela and Brazil. Flowers in summer to winter.

12. *HABENARIA STRICTISSIMA* Rchb.f. var. *ODONTOPETALA* (Rchb.f.)

L.O.Wms. in Bot. Mus. Leaf. Harv. Univ. 7 (1939) 184.

Habenaria odontopetala Rchb.f. in Linnaea 18 (1844) 407. *Habenaria Garberi* Porter in Bot. Gaz. (1880) 135. *Platanthera Garberi* Chapm., Fl. S. U.S., ed. 3 (1897) 486. *Habenella Garberi* Small, Fl. S.E. U.S., ed. 1 (1903) 316.

Roots rather numerous, pubescent, with two or three tubers borne at tips; tubers oblong or ovoid, generally rather truncate at one or both ends, to 5 cm long, 2.5 cm in diameter. Stems variable, to 45 cm high, usually sprawling, often somewhat prostrate, leafy. Leaves becoming bracteose apically, sheathing, oblong-lanceolate, acute, to 18 cm long and 4 cm broad, prominently

venose, keeled toward base, grey-green below. Bracts leafy, 1.5 cm long and 5 mm broad at base, ovate, acute, conduplicate, almost concealing pedicellate ovary. Spike quadrangular, many-flowered, the buds almost round, compressed laterally, bright green. Flowers yellowish-green, particularly the petals and lip, sweetly fragrant, persistent, about 13 mm across lateral sepals. Dorsal sepal forming a galea with the petals, oblong, somewhat obtuse, few-nerved, about 5 mm long and 3 mm broad, hyaline marginally. Lateral sepals spreading, at right angles to dorsal, triangular-oblong, obtuse, few-nerved, 6.5 mm long, 3 mm wide. Petals rigidly erect, ligulate, slightly and irregularly bilobulate at apex, about 4 mm long, 2 mm across, narrowing to 1.5 mm broad at base, yellowish apically, greenish-white below. Lip trilobulate, yellow-green, whitish basally, about 9 mm long, almost parallel to ovary, deflected outward at apex; midlobe ligulate, acute or obtuse, slightly broader at base, 11 mm long and 1.5 mm broad, with two rather large irregular yellowish calli at extreme base; lateral lobes 0.25 mm long, triangular, obtuse, at extreme base of segment. Spur longer than pedicellate ovary, white at base, green apically, slightly twisted, compressed near apex, linear-lanceolate, enlarged toward tip, hyaline on apical margins.

Rather widely and commonly distributed in central and southern peninsular Florida. Also in the West Indies and Central America. Flowers in the winter and spring.

Notes on Wisconsin Parasitic Fungi. XIV.

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The fungi referred to in this series of notes were, unless it is stated otherwise, collected during the season of 1949.

PHYSODERMA CLAYTONIANA Greene (Farlowia 1: 569. 1944) is the subject of a paper by F. K. Sparrow (Amer. Jour. Bot. 34: 325-329. 1947) in which the parasite is illustrated and its effect on the host, *Claytonia virginica*, is shown in a series of figures. An emended and expanded description is given.

Powdery mildews, undetermined as to species, occurred on the following hosts, not before reported as bearing this class of fungi in Wisconsin: *Desmodium bracteosum* var. *longifolium*, Green Co., New Glarus Woods, August 23; *Hypericum perforatum*, Dane Co., Madison, September 5; *Aster shortii*, Green Co., New Glarus Woods, August 5, 1948; *Chrysanthemum leucanthemum* var. *pinnatifidum*, Sauk Co., Parfrey's Glen, August 16; *Cacalia tuberosa*, Dane Co., Madison, September 1; *Senecio aureus*, Sauk Co., Baxter's Hollow, Town of Sumpter, August 30; *Prenanthes racemosa*, Dane Co., Madison, September 2.

STAMNARIA AMERICANA Mass. & Morg., on *Equisetum hyemale*, has been studied, morphologically and cytologically, by M. E. Hoppe as a senior thesis subject at the University of Wisconsin. This species is notable for characteristic and elaborately, though compactly, branched haustoria.

TAPHRINA SACCHARI Jenkins was reported by me (Trans. Wis. Acad. Sci. 32: 81. 1940) as occurring on *Acer saccharinum* in Wisconsin. The correct host is sugar maple, *Acer saccharum*.

PUCCINIA RUBIGO-VERA (DC.) Wint. I has been collected several times in Wisconsin on *Anemone virginiana*. Pycnia of what I take to be this species developed on *Anemone cylindrica* in June at Ferry Bluff, Sauk Co.

ASTEROMA VENULOSUM (Wallr.) Fckl. was reported by Davis as occurring on *Iris* in Wisconsin (Trans. Wis. Acad. Sci. 2: 166. 1893) and there are three specimens filed under this name. However, examination of them indicates that they are in no way different from similar more numerous specimens of *Phyllosticta iridis* Ell. & Mart. It appears to me that *A. venulosum* is a dubious and poorly described species at best, and I am placing all the Wisconsin specimens under *P. iridis*.

PHYLLOSTICTA sp., on *Solidago speciosa*, collected near Jonesdale, Iowa Co., August 18, 1948, is another in a growing list of Wisconsin *Phyllostictae* which are but dubiously parasitic. The epiphyllous pycnidia are scattered or gregarious, subglobose, and rather imperfectly developed below, 65-100 μ diam., pseudoparenchymatous, pale brown, with the ostiole marked by a dark-

ened ring of cells. The hyaline conidia are about $4 \times 2 \mu$. The spots are rounded or irregular, mostly 1-2 mm. diam., tan below, and ashen, with a darker elevated border, on the upper leaf surface. Many of the pycnidia are empty.

Panicum perlongum, collected at Madison in May, bears flattened pycnidia in ill-defined spots on the brownish distal portion of the current season's leaves. The hyaline conidia are subcylindric to subfusoid, and continuous, so far as observed. It is possible that this is an immature development of *Ascochyta graminicola* Sacc., or one of its varieties.

PHOMA IOWANA Sacc. produces characteristic lesions on the stems and leaves of *Aster ptarmicoides*, and has ovoid conidia approx. $10-12 \times 8 \mu$. However, in a specimen collected in Columbia Co. near Prairie du Sac, while the lesions are of the usual type and the fungus has the appearance externally of *P. iowana*, the conidia are decidedly smaller, about $8 \times 4 \mu$, and tend to be subfusoid, of the sort often seen in *Phomopsis*. The specimen seems well matured.

CONIOTHYRIUM sp. occurs on leaves of *Celtis occidentalis*, collected at Madison, August 5, 1943. The spots are irregular, grayish-brown, mostly 2-4 mm. diam. The pycnidia are epiphyllous, gregarious, blackish-brown, rather small, about 75μ diam. Conidia smoky greenish, broadly ellipsoid, $5.6 \times 4 \mu$.

ASCOCHYTA ASCLEPIADIS Ell. & Ev. is probably but a state of *Stagonospora zonata* J. J. Davis, as suggested by Davis. In a specimen of "*Ascochyta*" on *Acerates hirtella* (*A. floridana*) from Madison the uniseptate conidia vary from the upper size limit for *A. asclepiadis* to well into the range of *S. zonata*.

SEPTORIA sp., on *Heuchera richardsonii*, collected at Madison in July, has small, black, globose pycnidia, $50-70 \mu$ diam., with continuous spores, $15-20 \times 1 \mu$. The spots are brown and rounded, about 2-3 mm. diam. This seems not to be *Septoria saxifragae* Pass., and as for *S. heucherae* Pass., I can find no report of that species, other than the mere citation of the name in a list of Indiana parasitic fungi by L. M. Underwood (Proc. Indiana Acad. Sci.: 149. 1894). The Seymour Index report is based on this item.

SEPTORIA ASTRAGALI Desm. and *Phleospora reticulata* Ell. & Ev. seem to be identical, judging from European material on *Astragalus* and American on *Lathyrus* and *Vicia*. The lesions are very similar, whatever the host, although on the thin leaves of *Vicia americana*, for example, they are less strikingly delineated than on the rather leathery leaves of *Lathyrus*. The conidia are characteristically elongate, but somewhat variable in width. Specimens in the University of Wisconsin Herbarium are currently filed under *S. astragali*.

SEPTORIA SENECIONIS-AUREI J. J. Davis on *Senecio aureus* was described from a specimen collected late in the season at Devils Lake, Sauk Co. The pycnidia occurred on indefinite gray portions within larger brown dead areas of the radical leaves. In May 1947, at Parfrey's Glen near Devil's Lake,

what appears to be the same species was found, likewise on the radical leaves of *Senecio aureus*. Here, however, the spots are very small, mostly about 1 mm. diam., with arid centers and narrow purple borders, and with one to several pycnidia per spot. These pycnidia are somewhat larger than those of *S. senecionis-aurei* as described, but the distinct cellular wall of the pycnidium and the small, slender spores, about $15\text{--}25 \times 1 \mu$ are identical. It seems likely that as the season progresses and the leaves become senescent the spots tend to become confluent and assume the characters set forth in the description.

GLOEOSPORIUM sp. (?) occurs on dead areas of overwintered green leaves of *Carex albursina*, collected near Cedarburg, Ozaukee Co., in May 1948. The epiphyllous acervuli seem to have originated intraepidermally. They are variable in size, up to about 80μ diam., or occasionally even more. The conidiophores are short, flask-shaped, closely crowded, about $3\text{--}4 \times 10\text{--}12 \mu$, somewhat grayish in mass. The slender, hyaline, rod-shaped conidia are $4\text{--}7 \times 0.5\text{--}1 \mu$. Possibly the spermogonial stage of an Ascomycete.

GLOEOSPORIUM sp., well characterized, but collected in only small amount, was on overwintered green leaves of the basal rosettes of *Pentstemon grandiflorus* collected at Madison in April. Acervuli are $65\text{--}100 \mu$ diam., subcuticular, amphigenous, but mostly epiphyllous, gregarious or crowded on ash-brown spots which are 2.5 mm. diam., and rounded to elliptic or fusoid, with conspicuous, mostly narrow purple borders; conidia falcate, *Colletotrichum*-like, or subcylindric, $13\text{--}20 \times 3\text{--}4 \mu$; conidiophores closely packed, short, slender.

BOTRYTIS, seemingly a single species, has been collected on conspicuous and very similar lesions on several native liliaceous hosts, including *Lilium michiganense*, *Maianthemum canadense*, *Polygonatum biflorum* and *Uvularia grandiflora*. The lesions are large, oval or ellipsoid, with a translucent, water-soaked appearance and rather wide reddish margins. It seems quite likely that the *Botrytis* is secondary, although I do not find evidence of bacterial infection. The spots are so characteristic that it is possible to predict in the field, previous to microscopic examination, that the *Botrytis* will be found on them.

HELMINTHOSPORIUM sp., which seems not to be *H. ravenelii* Curtis (found sometimes on the inflorescence of species of *Sporobolus*), has been observed on leaves of *Sporobolus asper*, collected in southwestern Dane Co. in August. The fungus occurs on rather elongate, pale, dull brown bordered spots, but is unfortunately too scanty to admit of more than a descriptive note as follows: conidia truncate at base, widest at about mid-section, tapered at tip, pale to dark olivaceous, 3.5-septate, $45\text{--}55 \times 11\text{--}15 \mu$; conidiophores closely clustered, but not fasciate, simple but somewhat tortuous, several-geniculate, dark olivaceous, tips paler, $35\text{--}80 \times 4\text{--}5 \mu$.

HELMINTHOSPORIUM seems not to have been reported heretofore on *Carex*, but a fungus plainly of that genus has been collected on non-fruiting, and hence specifically indeterminate, plants belonging to the *Carex convoluta*-*C. rosea* group growing in a maple woods near Albany, Green Co., May 8, 1948. The fungus occurred on both living and dead leaves and the following

notes were made: Spots small, dark brown, rounded or irregularly elongate on living leaves (dead leaves are uniformly pale brown with the fungus not so localized); conidiophores dark olivaceous, short, not branched, once or twice geniculate, continuous or once septate, scattered or aggregated in small tufts, $15.33 \times 6.7 \mu$; conidia variable, straight or slightly curved, $65.100 \times 8.13 \mu$, widest $1/3$ of the way above the base, tapering slightly, or in the case of the longer conidia tapering strongly upward, mostly 8-10-septate, pale fuliginous, hilum prominent, walls strongly thickened with obvious protoplasmic connections between the adjacent cells. In shape, and in the prominent hilum, the conidia are much like those of *H. rostratum* Drechsler which occurs on species of *Eragrostis*. However, the conidia of the species on *Carex* are decidedly lighter in color, and the conidiophores are much shorter than in *H. rostratum*. This is probably a new species, but since the host is not known, it seems desirable to defer formal description.

CERCOSPORA sp. on leaves of *Sphenopholis intermedia* (pallens) from Madison was well-defined but found in only small amount. The spots are small, pale, and rounded; conidiophores $65.80 \times 5.6 \mu$ below, somewhat narrower above, pale brown, several-septate, usually not more than once geniculate, in tufts of about 5 or 6; conidia curved, slender, much tapered in the upper $2/3$, almost hyaline, multiseptate, $4.5 \times 125.150 \mu$, or occasionally longer. Chupp states that this is close to *C. agrostidis* Atk., as he has seen it on *Sphenopholis obtusata*, except that in my material both phores and conidia are wider.

CERCOSPORA CARICIS Oud., according to Chupp, takes precedence over *C. caricina* Ell. & Dearn. which is therefore a synonym. Wisconsin specimens have been filed under the latter name.

ALTERNARIA sp. was abundant on the immature green pods of *Baptisia leucantha*, collected at Madison in early July. The lesions are sharply defined and the fungus appears parasitic. Nearly all of the pods on many plants in a large colony were infected. The fungus soon overruns the entire pod, causing blackening and dropping.

Euphorbia esula, a highly pernicious weed in Wisconsin and elsewhere, generally seems free from fungus infection. However, in a large patch near Madison most of the leaves bore grayish, rounded spots on which occurred a species of *Alternaria* having pale spores with only slight vertical septation. It may be doubted that this is *Alternaria brassicae* (Berk.) Sacc., reported on this host. Most of the leaves were yellowed and about to fall, or had already fallen. The observation was made July 8, at the height of the growing season, following a period of extremely warm and humid weather.

Panicum scribnerianum, collected near Avoca, Iowa Co., in August, bears numerous globular black sclerotia on mottled areas on the leaves. So far undetermined, but perhaps parasitic.

Botrychium virginianum, collected in the New Glarus Woods, Green Co., in August, had the fronds lightly to heavily parasitized by a fungus which formed conspicuous black incrustations on many plants of this species. The crusts are composed of closely clustered black, globose, pseudoparenchymatous

bodies, about 30-50 μ diam. These bodies are amphigenous, but most profuse on the upper leaf surface. In free-hand sections they appear to be intraepidermal, but the entire leaf is packed with the gnarled, closely septate mycelium. Some of the globose bodies contain microconidia of the spermatogonial type, about 4x1 μ . This appears to be an immature Ascomycete. There is surely no question of the organism's parasitism in the early stage of development in which I found it.

ADDITIONAL HOSTS

The following hosts have not been previously recorded as bearing the fungi mentioned in Wisconsin.

ERYSIPHE POLYGONI DC. on *Anemone canadensis*. Dane Co., Verona, August 19, 1941. Also on *Ranunculus pennsylvanicus*. Waukesha Co., Eagleville, October 6, 1941.

GNOMONIA ULMEA (Schw.) Thum. *Gloeosporium* stage on *Ulmus fulva*. Green Co., Town of Exeter near Attica, June 15.

VENTURIA INAEQUALIS Wint. *Fusicladium dendriticum* stage on Hop crab (*Pyrus niedzwetzkyana* X *baccata*). Dane Co., Madison, July 10.

ACANTHOSTIGMA OCCIDENTALE (Ell. & Ev.) Sacc. on *Artemisia serrata*. Dane Co., Mazomanie, July 30. An imperfect stage, with conidia 4-6 x 2.5-3 μ .

EPICHLOE TYPHINA (Pers.) Tul. on *Agrostis hyemalis*. Dane Co., Madison, July 14. Immature, but sufficiently characteristic for satisfactory determination.

DIBOTRYON MORBOSUM (Schw.) Theiss. & Syd. on *Prunus cerasus* X *domestica*. Douglas Co., Brule, October 5, 1946. Coll. & det. by E. M. Gilbert.

USTILAGO STRIIFORMIS (West.) Niesl on *Elymus canadensis*. Rock Co., Tiffany, July 17, 1947. On *Agrostis hyemalis*. Dane Co., Madison, July 14. Not listed by Seymour on the latter host.

ENTYLOMA COMPOSITARUM Farl. on *Aster prenanthoides*. Iowa Co., Canyon Park near Dodgeville, June 23, 1947. Det. H. S. Jackson. This collection was referred to in an earlier note (Amer. Midl. Nat. 39: 447. 1948), but the smut spores within the leaf tissue were in some inexplicable fashion overlooked. Apparently the first report of *Entyloma* on this host.

PUCCINIA ANGUSTATA Peck III on *Scirpus rubrotinctus*. Bayfield Co., Madeline Island. June 15, 1948. Coll. D. Grether. On the still attached previous year's leaves. Hitherto recorded on this host only from Canada, so far as I am aware.

PUCCINIA ELLISIANA Thum. I on *Viola eriocarpa* (Fungi Columbiani No. 3974). G. B. Cummins informs me that this material was collected in Wisconsin. There is no specimen in the Wisconsin Herbarium.

PUCCINIA VIOLAE (Schum.) DC. I on *Viola incognita*. Sauk Co., Devils Lake, May 29, 1948. Also on *Viola conspersa*. Racine Co., Racine, May 1886 and Sept. 26, 1888. Coll. J. J. Davis (North American Uredinales Nos.

373 and 673). The specimens are labeled as being on *Viola labradorica* which does not occur in Wisconsin. It seems likely that Davis' report of *Puccinia violae* on *Viola canina* var. *muhlenbergii* should also be referred to this host.

PUCCINIA EXTENSICOLA Plowr. I on *Aster pilosus*. Dane Co., Madison, May 16. Host identification was confirmed by demonstration of the connection between the nondescript new leafy shoots and the very characteristic previous year's flowering stalk.

PHYLLOSTICTA QUERCUS Sacc. & Speg. on *Quercus rubra*. Dane Co., Madison, July 3.

PHYLLOSTICTA CHENOPODII-ALBI Siemaszko on *Atriplex patula*. Dane Co., Madison, July 4. My reasons for using this name are given in my third series of notes (Trans. Wis. Acad. Sci. 35: 129. 1944).

PHYLLOSTICTA DESMODII Ell. & Ev. on *Desmodium bracteosum* var. *longifolium*. Green Co., New Glarus Woods, August 23. The large pycnidia are strikingly nervisequous.

PHYLLOSTICTA MONARDAE Ell. & Barth. on *Pycnanthemum virginianum*. Dane Co., Madison, August 20. The spots are definite and conspicuous, with wide deep purple margins and ashen centers. The conidia are slightly larger here than in other specimens on related hosts in the Labiatae.

PHYLLOSTICTA UMBRINO-FUMOSA Greene on *Eupatorium purpureum*. Green Co., New Glarus Woods, June 8. This species was described (Trans. Wis. Acad. Sci. 38: 243. 1946) from material on *Eupatorium rugosum* (*urticaefolium*).

PHYLLOSTICTA LIATRIDIS J. J. Davis on *Liatris pycnostachya*. Jefferson Co., Faville Grove, August 4. Davis described this species as on *Liatris spicata* from a station in Burnett Co., in northwestern Wisconsin. Unless the host was in cultivation, it seems probable that it was incorrectly determined, since the only authentic Wisconsin herbarium specimens of *L. spicata* are from extreme southeastern Wisconsin. However, *Phyllosticta liatridis* has recently been collected at Madison on transplanted specimens of *Liatris spicata*.

PHYLLOSTICTA CACALIAE H. C. Greene on *Silphium perfoliatum*. Dane Co., Madison, July 19. Identical with material on *Cacalia tuberosa*, even as to the type of lesion produced. There is a group of *Phyllostictae* on Compositae in Wisconsin which would seem to be closely related. All are characterized by rather large pycnidia containing small cylindrical conidia borne on large brown to cinereous dead areas. The reason for the Rules recommendation that specific epithets be not based on host names is illustrated by this example, for the *Phyllosticta* in question is probably no more characteristic of *Cacalia* than of *Silphium*. In large genera such as *Phyllosticta*, however, most of the truly descriptive epithets have long since been applied. Frequently, though differences between species may be real, they are not sufficiently outstanding to render easy the application of differentiating descriptive names. Also collected on *Senecio aureus*. Sauk Co., Baxter's Hollow, Town of Sump-

ter, August 30. On this host the conspicuous spots are rounded, with pale brown or ashen centers and wide, dark purple margins.

CONIOTHYRIUM FUEKELII Sacc. on *Ulmus parvifolia*. Grant Co., Blue River, August 26. Perhaps questionably parasitic, but the fungus is on sharply defined spots and there is no evidence of insect damage.

ASCOCHYTA GRAMINICOLA Sacc. on *Festuca ovina*. Dane Co., Madison, August 19. This is a highly variable species and varieties have been named. In this specimen considerable differences in conidial size were observed in different pycnidia from lesions on the same leaf.

ASCOCHYTA ACTAEAE (Bres.) J. J. Davis on *Actaea alba*. Columbia Co., Gibraltar Rock near Okee, July 13.

ASCOCHYTA BOHEMICA Kab. & Bub. on *Campanula americana*. Green Co., New Glarus Woods, August 5, 1948. On this host the spots are small, 2-3 mm. diam., and purple margined, in contrast to the large, dull, immarginate spots on *Campanula rapunculoides*. Microscopically, however, there is close agreement.

DARLUCA FILUM (Biv.) Cast. on *Coleosporium solidaginis* (Schw.) Thum. II on *Solidago altissima*. Dane Co., Madison, September 2.

STAGONOSPOR ATRIPLICIS (West.) Lind. on *Chenopodium hybridum*. Dane Co., Madison, August 1. The pycnidia are nervisequous and there are large wedge-shaped dead areas on the infected leaves. The conidia are about $15-20 \times 3.5-4.5 \mu$ and are 0-3-septate.

STAGONOSPOR A POLYTAENIAE H. C. Greene on *Pastinaca sativa*. Dane Co., Madison, July 5. Originally collected on *Polytaenia nuttallii*. On *Pastinaca*, with its larger and softer leaflets, the spots are larger and many of the pycnidia are somewhat over the top limit of 150μ as described. The conidia are identical and the immarginate grayish-brown spots seem characteristic also.

STAGONOSPOR APOCYNII (Pk.) J. J. Davis on *X Apocynum medium*. Dane Co., Madison, September 9.

SEPTORIA AGROPYRINA Lobek on *Agropyron trachycaulum* var. *glaucum* (*A. subsecundum*). Columbia Co., Black Hawk's Lookout near Prairie du Sac, July 29.

SEPTORIA TANDILENSIS Speg. on *Panicum subvillosum*. Vilas Co., Trout Lake, August 28, 1929. Host coll. & det. N. C. Fassett. On a phanogamic specimen in the University of Wisconsin Herbarium.

SEPTORIA DIVARICATA Ell. & Ev. on *Phlox amoena* (cult.) Dane Co., Madison, May 2.

SEPTORIA PENTSTEMONIS Ell. & Ev. on *Pentstemon grandiflorus*. Dane Co., Madison, April 25. On the green, overwintered basal leaves. The host plants were obtained near Lyndon Station, Juneau Co., and were moved into the University Arboretum in 1948.

SEPTORIA VALERIANAE Sacc. & Fautr. on *Valeriana officinalis*. Dane Co.,

Madison, July 7, 1948. On leaves also infected with *Ascochyta valerianae* Smith & Ramsb.

SEPTORIA ASCLEPIADICOLA Ell. & Ev. on *Asclepias tuberosa*. Dane Co., Madison, September 15.

SEPTORIA EUPATORII Rob. & Desm. on *Eupatorium maculatum*. Dane Co., Madison, August 7. Although the parasite exhibits morphological constancy, the various species of *Eupatorium* are affected quite differently. On *E. maculatum* the spots are large, orbicular, immarginate and a uniform brown.

SEPTORIA ATROPURPUREA Peck on *Solidago missouriensis* var. *glaberrima* Iowa Co., Arena, June 10. The conidia are up to $70 \times 2.5 \mu$, which would seem well outside the range of *Septoria fumosa* Peck, the commonly encountered early season form. Also on *Solidago rigida*. Green Co. near Albany, August 7, 1948. The conidia are about $50-65 \times 2 \mu$, clearly septate.

SEPTORIA SOLIDAGINICOLA Peck on *Aster cordifolius*. Sauk Co., Ferry Bluff, Town of Prairie du Sac, October 10, 1942.

HAINESIA LYTHRI (Desm.) Höhn. on *Rhus glabra*. Dane Co., Madison, July 27. On very definite lesions, it appears parasitic, but is possibly only secondary. On *Rhus typhina*. Dane Co. near Verona, August 1. On *Rhus radicans*. Dane Co., Sect. 20, Town of Primrose, August 1. On *Rhus aromatica*. Dane Co., Madison, August 8. On *Penthorum sedoides*. Dane Co., Madison, October 7, 1944. This was erroneously referred to *Patellina* sp. in an earlier note (Trans. Wis. Acad. Sci. 38: 223. 1946). On *Geum triflorum*. Dane Co., Madison, August 9, 1945. The stage *Sclerotiopsis concava* (Desm.) Shear & Dodge occurs in small amount in this specimen.

COLLETOTRICHUM GRAMINICOLUM (Ces.) Wils. on *Glyceria striata*. Dane Co., Madison, June 3, 1948.

COLLETOTRICHUM VIOLAE-ROTUNDIFOLIAE (Sacc.) House on *Viola pubescens*. Green Co., Albany, May 7. On *Viola "cucullata"*. Dane Co., Madison, June 28.

RAMULARIA PRATENSIS Sacc. on *Rumex obtusifolius*. Sauk Co., Baxter's Hollow, Town of Sumpter, June 16.

RAMULARIA OCCIDENTALIS Ell. & Kell. on *Rumex crispus*. Sauk Co., Parfrey's Glen, Town of Merrimac, August 16. Also at Madison, August 28.

RAMULARIA TARAXACI Karst. on *Hieracium longipilum*. Sauk Co., near Prairie du Sac, June 24. The conidia seem identical with those produced on *Taraxacum*, but the phores are shorter, perhaps a response to a host and environment which were both xerophytic. A small undetermined earlier collection on this host was made at Madison in 1944 (Amer. Midl. Nat. 41: 730. 1949).

HELMINTHOSPORIUM RAVENELII M. A. Curt. on inflorescence of *Sporobolus cryptandrus*. Sauk Co., Lake Deltor, August 1948. Coll. E. K. Jones.

HELMINTHOSPORIUM BROMI Died. on *Bromus ciliatus*. Dane Co., Madi-

son, August 20. The first collection made in this state, so far as I am aware, on a native non-weedy species of *Bromus*.

CERCOSPORA TEUCRII Ell. & Kell. on *Teucrium occidentale*. Dane Co., Madison, July 19.

CERCOSPORA PHYSALIDIS Ell. on *Physalis subglabrata*. Dane Co., Primrose Prairie, Town of Perry, August 12.

CERCOSPORA LOBELIAE Ell. & Ev. on *Lobelia cardinalis*. Dane Co., Madison, August 15. A scanty collection, confined to a single leaf, but nevertheless plainly referable to this species.

CERCOSPORA CLAVATA (Ger.) Peck on *Asclepias ovalifolia*. Dane Co., Madison, July 19. An earlier collection of *Cercospora* on this host was determined as *C. incarnata* Ell. & Ev., but the wide, stubby, brownish conidia of this specimen are entirely characteristic of *C. clavata*.

CERCOSPORA SOLIDAGINIS Chupp & Greene on *Solidago missouriensis* var. *fasciculata*. Dane Co., near Cross Plains, August 10, 1948. Coll. R. Burton.

TUBERCULINA PERSICINA (Ditm.) Sacc. on *Puccinia sessilis* on *Iris virginica* var. *shrevei*. Iowa Co., Tower Hill State Park, June 24. On *Tranzschelia pruni-spinosae* on *Hepatica acutiloba*. Green Co., Oakly, May 6. On *Uromyces silphii* on *Silphium terebinthinaceum*. Jefferson Co., Lake Mills, June 30, 1948. (Other hitherto unreported collections have been made on aecia of *Puccinia eleocharidis*, *P. peridermiospora*, *P. seymouriana*, *Uromyces perigynius*, *U. proeminens* and *U. scirpi*)

ADDITIONAL SPECIES

The fungi mentioned have not been previously reported as occurring in Wisconsin.

PERONOSPORA ECHINOSPERMI Swingle on *Lappula virginiana*. Green Co., Town of Exeter, June 15. Det. C. G. Shaw.

BOTRYOSPHERIA RIBIS Grossenb. & Duggar on *Rhus typhina*. Dane Co., Madison. Coll. R. E. Vaughn. Bragonier (Phytopath. 39: 3. 1949) reports "umbrella disease" of *Rhus* in Wisconsin and, in a personal communication, states that he has examined the Madison specimen.

UROMYCES VALENS Kern II, III on *Carex lupulina*. Polk Co., St. Croix Falls, August 25, 1914. Coll. J. J. Davis. Davis placed this in the herbarium as an undetermined *Uromyces*, but material was sent to Arthur who cited the specimen in his Manual. Not mentioned by Davis in any of his notes, so far as I have been able to determine.

CORTICUM ANCEPS (Bres. & Syd.) Gregor, as *Sclerotium deciduum* J. J. Davis, has been reported on various hosts in Wisconsin, including *Adiantum pedatum*, *Pteridium aquilinum*, *Onoclea struthiopteris*, *Ranunculus septentrionalis*, *Mitella diphylla*, *Fragaria virginiana*, *Rubus allegheniensis*, *Aralia nudicaulis*, *Trientalis americana*, *Solidago canadensis*, *Aster paniculatus*, *Silphium terebinthinaceum* and *Bidens frondosa*. Additional hosts are as follows:

Onoclea sensibilis, Jackson Co., Black River Falls, June 1916; *Hydrophyllum virginianum*. Vernon Co., Viroqua, May 1930; *Solidago serotina* (*gigantea*), various specimens from Chippewa, Dane, Grant, and Sawyer Cos.

PHYLLOSTICTA MENISPERMICOLA Tehon & Daniels on *Menispermum canadense*. Dane Co., Madison, August 1.

Ascochyta equiseti (Desm.) n. comb. (*Phoma equiseti* Desm.) A specimen collected near Mazomanie, Dane Co., July 30, is an *Ascochyta*. Viewed under the low power binocular, the material appeared similar to European specimens of *Phoma equiseti* Desm. Krieger's Fungi saxonici No. 1885 proved to be practically identical with the Wisconsin specimen, and a large percentage of the conidia were septate. Jaap's No. 787 of his Fungi selecti exsiccati showed only a few septate conidia, but was otherwise very similar. As would be expected, the septate conidia are larger than the nonseptate, running $8-11 \times 3-4 \mu$. In the Wisconsin specimen, which appears to be definitely parasitic, the conidia are extruded in yellow-orange masses from some of the pycnidia on *Equisetum arvense*.

ASCOCHYTA CAULICOLA Laubert on *Melilotus alba*. Dane Co., Madison, July 8, 1937. Coll. & det. F. R. Jones. Davis mentioned this as being a synonym of *Ascochyta lethalis* Ell. & Barth. (*Mycosphaerella lethalis* Stone), but Jones (Jour. Agr. Res. 57: 806. 1938) states "... *Ascochyta caulicola* Laub. is considered to be a valid name applying to the fungus that causes hypertrophy of the host plant, and not a synonym of *A. lethalis*."

Apiocarpella agropyri sp. nov. R. Sprague

Maculis orbicularibus, sub-elongatis vel coalesco-irregularibus, $4-20 \times 3-5$ mm., avellaneo-brunneis, centris fulvis, marginibus angustis, brunneis; pycnidia globosis, erumpentibus, ostiolatis, brunneo-aureis, $70-130 \mu$ diam.; pycnosporulis angusto-navicularibus, vel fusiformibus, basis obtusis, apicibus angustis acutis, septatis prope basis, subhyalinis, $17-22.5 \times 2.8-4.2 \mu$.

Spots round or more often elliptical or elongate, coalescing into irregular lesions, $4-20 \times 3-5$ mm., drab brown, center buff brown or tawny, narrow margin of darker brown, sometimes surrounded by wider yellow areas; pycnidia globose erumpent, ostiolate, golden brown, $70-130 \mu$ diam., not prominent; spores exuding in very short tendrils, narrowly boat-shaped to fusiform, base blunt, apex tapering to a sharp point, septation about $1/3$ distance from base, slightly constricted, spores hyaline, $7-22.5 \times 2.8-4.2 \mu$.

On living leaves of *Agropyron repens*. Madison, Dane County, Wisconsin, U. S. A., July 2, 1949. Coll. H. C. Greene.

Stagonospora celtidis (Ell. & Mart.) n. comb. (*Phleospora celtidis* Ell. & Mart., Jour. Mycol. 3: 87. 1887). The same fungus was described several years later as *Septoria gigaspora* Ell. & Ev. and finally by me as *Stagonospora macromaculans* (Amer. Midl. Nat. 41: 721. 1949). The most distinctive microscopic feature of this organism is the relatively small, but prominently defined ostiole. The pycnidium is subrostrate and the ostiole is bordered by

a ring of small, dark, tightly packed cells, so I do not understand why this species was described as a *Phleospora*. There is more ground for considering the fungus to be a *Septoria*, but despite the relatively great length of the spores their marked thickness indicates that they are not scolecospores. The pycnidial wall is entire, although thinner below.

SEPTORIA CALAMAGROSTIDIS (Lib.) Sacc. on *Agrostis hyemalis*. Dane Co., Madison, July 14. Det. R. Sprague.

SEPTORIA PIMPINELLAE Ell. on *Taenidia integerrima*. Dane Co., Madison, June 27. The curved spores are very short and slender to be produced in such relatively large pycnidia. The spores are mostly about $15\text{--}20 \times 1.5 \mu$, while the pycnidia run well over 100μ diam. It is suggestive of *Phomopsis*. Ellis states (Jour. Mycol. 7: 277. 1894) "... resembling the sporules of a *Phlyctaena*. Some of the perithecia contain short, oblong-fusoid 2-nucleate sporules $6\text{--}9 \times 2\frac{1}{2} \mu$, hyaline, (*Phyllosticta* sp.). The *Septoria* has the sporules shorter than in any of the other described species on *Umbelliferae*." I do not find any *Phyllosticta*, but otherwise my material corresponds closely.

Septoria inclusa sp. nov.

Maculis subpurpureis, irregularibus, angulatis vel circulis, plerumque 2-5 mm. diam.; pycnidiiis nigris, inconspicuis, subglobosis, subrostratis, vix erumpentibus, amphigenis, paucis, $45\text{--}60 \mu$ diam.; conidiis rectis vel curvis leniter, hyalinis, continuis plus minusne granulosis languido, 15-30, plerumque 20-25, $\times 1\text{--}1.5 \mu$.

Spots dull purplish, irregular, angled or rounded, mostly 2-5 mm. diam.; pycnidia black, inconspicuous, subglobose, subrostrate, scarcely erumpent, amphigenous, small, 45-60 μ diam.; conidia straight or slightly curved, hyaline, continuous, faintly granular, 15-30, mostly 20-25, $\times 1\text{--}1.5 \mu$.

On living leaves of *Parthenium integrifolium*. Madison, Dane County, Wisconsin, U. S. A., July 19, 1949.

The tiny, subepidermal pycnidia are hardly discernible with a hand lens. In section, only the short beak of the pycnidium is seen to project slightly. A smaller and more delicate species than either *Septoria xanthifolia* Ell. & Kell. or *S. silphii* Ell. & Ev. on the closely related *Iva* and *Silphium* respectively.

Colletotrichum prunicolum sp. nov.

Maculis pallido-brunneis, marginibus angustis, rufis, rotundatis vel irregularibus nonnihil, non angulosis, 2-6 mm. diam.; acervulis rotundatis vel ellipticis, amphigenis, plerumque epiphyllis, subcuticularibus, 65-200 μ diam.; setis fusco-purpureis, rectis vel subflexuosis, pallidioribus supra leviter, apicibus acutis, 0-3-septatis, 50-200 $\times 4.5\text{--}7 \mu$; conidiis hyalinis, falcatis, granulosis, continuis, 19-23 $\times 3.5\text{--}4 \mu$.

Spots pale brown with narrow reddish margin, rounded or somewhat irregular, not angled, 2-6 mm. diam.; acervuli rounded or elliptic, amphigenous, mostly epiphyllous, subcuticular, 65-200 μ diam.; setae fuscous-purple, straight

or somewhat flexuous, slightly paler above, tips acute, 0.3-septate, 50-200 x 4.5-7 μ ; conidia hyaline, falcate, granular, continuous, 19-23 x 3.5-4 μ .

On living leaves of *Prunus serotina*. Madison, Dane County, Wisconsin, U. S. A., August 16, 1946. Coll. M. P. Backus.

The sharply defined spots are on leaves picked at the height of the season and it seems reasonably certain that the fungus developed parasitically. The ends of the conidia are strongly attenuate. Several species of *Vermicularia* (*Colletotrichum*) have been described as occurring on leaves of *Prunus* in Europe and Australia, but none of them seem close to this fungus.

Colletotrichum hysteriiformis (Peck) n. comb. (*Vermicularia hysteriiformis* Peck, New York State Mus. Bull. 167. Rept. State Botanist for 1912, p. 32). On *Caulophyllum thalictroides*. Coll. in Wisconsin at Blue Mounds (Trans. Wis. Acad. Sci. 32: 82. 1940).

Cylindrosporium vagnerae sp. nov.

Maculis orbicularibus, 5-10 mm. diam., purpureis, marginibus fuscis, acervulis epiphyllis, subcuticularibus, fumosis, inconspicuis, circulis, 100 μ diam. ca.; conidiophoris tenuibus, confertis, 10 μ longis; conidiis hyalinis, 30-40 x 3-4 μ , tenuo-fusoides, leniter vel fortiter curvis, 3-septatis.

Spots orbicular, 5-10 mm. diam., purplish with darker border; acervuli epiphyllous, subcuticular, sooty, inconspicuous, round, about 100 μ diam.; conidiophores slender crowded, about 10 μ long; conidia hyaline, 30-40 x 3-4 μ ; slender-fusoid, slightly to strongly curved, uniformly 3-septate.

On living leaves of *Smilacina racemosa*. Madison, Dane County, Wisconsin, U. S. A., August 1, 1949.

Assigned to *Cylindrosporium* in spite of the septation and subcuticular position. There seems to be no other suitable place for such forms. Many septate species have been described. Although the conidia are of a shape often found in species of *Colletotrichum*, there is no evidence whatsoever of setae in this material.

Ramularia wisconsinensis sp. nov.

Maculis immarginatis, pallido-brunneis, irregularibus, angulatis vel rotundatis, parvis vel magnis, conidiophoris amphigenis, plerumque hypophyllis, laxe fasciis vel sparsis, brevibus, rectis vel curvis leniter, interdum 1-geniculatis, frequenter 1-septatis, apicibus denticulatis vel truncatis, vel acuminatis interdum, 10-25 x 3.5-4.5 μ ; conidiis hyalinis, cylindraceis vel subfusoides, continuis vel 1-septatis, 10-20 x 3-4 μ .

Spots immarginate, pale brown, irregular, angled or rounded, small or large; conidiophores amphigenous, mostly hypophyllous, loosely tufted or scattered, short, straight or slightly curved, occasionally once-geniculate, frequently 1-septate, tips denticulate, truncate or sometimes acuminate, 10-25 x 3.5-4.5 μ ; conidia hyaline, cylindric or subfusoid, continuous or 1-septate, 10-20 x 3-4 μ .

On living leaves of *Erechtites hieracifolia*. Madison, Dane Co., Wisconsin, U. S. A., August 28, 1949.

Heterosporium equiseti sp. nov.

Ramulis apicibus brunneis; conidiophoris fasciis in stomatibus, variis, 60-100 x 3-4 μ ca.; x-septatis, x-geniculatis, tortis, ramosis restricte, apicibus denticulatis, saepe amplis et nodulosis, brunneo-olivaceis; conidiis asperatis, subcylindraceis, 2-3-septatis, 16-22 x 5-7 μ , pallido-brunneis.

On brown distal portions of branchlets; conidiophores tufted, emerging from stomata, variable, 60-100 x 3-4 μ ca., several-septate, several-geniculate, tortuous, sparingly branched, apices denticulate, often enlarged and nodulose, brownish-olivaceous; conidia asperate, subcylindric, 2-3-septate, 16-22 x 5-7 μ , pale brown.

On branchlets of *Equisetum sylvaticum* var. *multiramosum*. Baxter's Hollow, Town of Sumpter, Sauk County, Wisconsin, U. S. A., June 16, 1949. Collected also on plants of *Equisetum arvense* var. *boreale* growing with those of the first-named host species, and on typical *E. arvense* at Madison, Dane Co., August 7.

The fungus develops progressively inward from the branchlet tips until the entire plant may be involved. As is frequently the case with exogenous fungi, many of the mature conidia have fallen away and most of those seen were continuous or 1-septate. Even these, however, clearly show the asperate condition.

CERCOSPORA SERIATA Atk. on *Sporobolus cryptandrus*. Dane Co., Town of Primrose, August 12. Although the host was growing mixed with plants of *Sporobolus asper*, the *Cercospora* was not observed on the latter, which is the host species from which Atkinson described the fungus.

CERCOSPORA NIGRICANS Cooke on *Cassia marilandica*. Iowa Co., near Mazomanie, August 18. Det. Chupp.

CERCOSPORA CLEOMES Ell. & Halst. on *Polanisia graveolens*. Dane Co., Basco, July 21.

CERCOSPORA TEPHROSIAE Atk. on *Tephrosia virginiana*. Iowa Co., Arena, August 18.

CERCOSPORA ERECHTITIS Atk. on *Hieracium aurantiacum*. Sauk Co., Parfrey's Glen, Town of Merrimac, August 16. Also in small amount on *Hieracium scabrum* at the same station. The determination was suggested by Chupp. I have not seen an authentic specimen on *Erechtites*, but the fungus on *Hieracium* matches the description very closely. The species is notable in having phores and conidia both exceptionally long. On *Hieracium* the spots are well-marked, one or two to a leaf, rounded with dark purple borders and ashen centers, when well-developed. They are mostly 2-4 mm. diam., but some are as much as 8 mm.

Utilization of Crawfishes by Cold-Blooded Vertebrates in the Eastern United States

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Many workers are likely to overlook the value of crawfishes as food for important species of cold-blooded vertebrates because quantitative figures of this aspect of wildlife management are so widely scattered. Data from 108 papers giving results of food habits studies of fishes, amphibians and reptiles are here combined into tables and graphs for easy reference.

Crawfishes are distributed over most of the United States. East of the Rocky Mountains all native species belong to the subfamily Cambarinae of the family Astacidae; to the west all native species belong to the subfamily Astacinae. These data are drawn only from the Eastern states where over 175 species in six genera are known.¹

Quantitatively crawfishes have been little studied. A few species, however, have been shown to exist in enormous numbers in their optimum habitats. Davis and Weibe (1930) reported the removal of over 500 pounds of unidentified crawfishes from a pond in Iowa slightly over an acre in extent which produced at the same time 7,581 fingerling black bass. Creaser (1934) found mixed *Cambarus bartoni* and *C. robustus* in Pine Brook of the Raquette River watershed in New York at the rate of 4,044 individuals per mile of stream (about 16 pounds per acre) which he stated was a production greater than that of the fishes present in the same brook. Surber (1936) reported unidentified crawfishes in a stream in Virginia at their peak of annual production in August and September at the rate of 3.1 individuals per square foot of bottom, or about 135,036 per acre. Langlois (1936) indicated *Cambarus rusticus* production in fish hatcheries in Ohio averaging about 850 pounds per acre with a peak of 1,587 pounds per acre in one pond in addition to the bass crop. Wickliff (1940) recorded peak production of unidentified crawfishes in stream riffles in Ohio between May and September: in a "sand and gravel" riffle he found 6,250 individuals per acre (27 pounds per acre); in a "gravel" riffle in May, three per square foot or 130,680 per acre (1,176 pounds per acre); and, in a "rubble" riffle in August four per square foot or 174,240 per acre (523 pounds per acre). He depopulated the rubble riffle and two days later it yielded at the rate of 6,070 crawfishes per acre, evidently being repopulated from adjacent parts of the stream. In the Cornell Experimental Fish Hatchery at Ithaca, New York, Tack (1941) recorded production of *Orconectes immunis* at the rate of from 36 to 255 pounds per acre in different

¹ Following the revision of the subfamily by Hobbs (1942a), which see for a key to the genera.

ponds. In Louisiana, I estimate that the fresh-water marshes near New Orleans yield a minimum of 5,000 *Procambarus clarkii* per acre annually; at an average of 35 crawfishes per pound this would approach 150 pounds per acre.

The reproductive potential of several species of crawfish is known, but a great deal more of this type of data must be gathered if we are to know how to utilize the crawfish crop intelligently in fish management, or as a natural food resource. The available data are summarized in Table 1.

TABLE 1.—Reproductive potentials of crawfishes.

Species	Size Range (Total Length)	Eggs per female			Authority
		Min.	Max.	Aver.	
<i>Orconectes propinquus</i>	32- 72 mm.	40	250	?	Van Deventer, 1937
<i>Orconectes rusticus</i>	46-102 mm.	80	574	276	Langlois, 1936
<i>Orconectes immunis</i>	46- 68 mm.	38	289	99	Tack, 1941
<i>Cambarus bartoni</i>	48- 84 mm.	7	133	58	Ortmann, 1906
<i>Procambarus clarkii</i>	62-104 mm.	81	652	313	Penn, 1943
<i>Cambarellus shufeldtii</i>	17- 23 mm.	27	60	34	Penn, 1942

Due to habitat requirements and size, many of our species of crawfishes are automatically ruled out of consideration for management purposes. Knowledge on which the utilization of particular species may be based, must come first from thorough food-habit studies of vertebrates in which food items are all identified to species. Unfortunately most investigators in the past have simply lumped all crawfishes under a single heading without reference to the species. The assumption by such workers that all crawfishes have the same habits is of course entirely erroneous. As a consequence the data on this phase are meager at best.

The few species of crawfishes known to be utilized are considered here in the order of their apparent importance (cf. Tables 2, 3 and 4).

Orconectes propinquus propinquus (Girard) is included commonly in the diet of fourteen fishes, one salamander and four turtles. It ranges from Quebec and Pennsylvania west to Wisconsin and Iowa, in small, cool, clear-water creeks and streams with bottoms of rock or stones over finer gravel and silt. The life cycle has been reported in detail by Van Deventer (1937).

Orconectes virilis (Hagen) is included in the diet of nine fishes and four turtles. It ranges from Ontario and Ohio on the east to Saskatchewan and South Dakota on the west, occurring abundantly in cold, trout streams, rivers and lakes. It shows a decided preference for bottoms with rocks or stones under which it may hide. According to Harris (1903) and Creaser (1931) the eggs are laid in the spring; however, little else has been published on the details of its life history.

Cambarus robustus Girard is included in the diet of ten fishes. It ranges from New York to West Virginia and Maryland and west to southern Ontario, Michigan and Ohio. Although it is found most abundantly burrowing under rocks in swift, shallow streams, it has also been reported from clear,

cool lakes with rocky or gravelly bottoms. Its habits are probably very similar to those of *C. bartoni*; however, the details of its life history have not been studied.

Cambarus diogenes Girard and its subspecies are included in the diet of seven fishes and one turtle. *C. diogenes* has been reported from almost every state east of the Mississippi River from Ontario to the Gulf, and in the northwest from Minnesota and Wyoming south to Colorado and Arkansas. This is a true burrowing species which is commonly associated with the building of "chimneys" in low, wet meadows and similar places. During the breeding season in the spring (April and May) it migrates to nearby ponds, lakes, streams and rivers where the eggs are laid and the young hatch. Later it returns to burrows. Since it is found in open waters only in the spring the species is available as food for aquatic vertebrates only during that time. A sizeable literature of scattered notes on the biology of this species has been built up, but there is a real need for detailed studies of its life history in several parts of its range.

Orconectes immunis (Hagen) and its subspecies are included in the diet of three fishes and three turtles. It ranges in the northeast from New York and Ontario west to North and South Dakota and south to Oklahoma and Tennessee. Members of this complex are found principally in quiet waters such as small lakes and ponds with muddy bottoms and vegetation which are subject to drying out in the summer. They have been recorded also from slow-flowing streams and rivers. A detailed study of the life history of *O. immunis immunis* in New York has been published by Tack (1941).

Orconectes rusticus (Girard) and its subspecies are included in the diet of two fishes and two turtles. This complex ranges from Ohio and Michigan west to Iowa and Illinois. The subspecies apparently all have much the same habitat requirements as *O. propinquus* with which they are often found. Preliminary studies of the life history in Ohio have been reported by Langlois (1936, 1937b).

Cambarus bartoni (Fabricius) and its subspecies are included in the diet of three fishes. Ranging from New Brunswick and Ontario south to Tennessee and North Carolina this is a subspecies complex which currently presents an involved taxonomic enigma greatly in need of solving. The subspecies apparently all show a decided preference for cold, swift-flowing mountain streams with rocky bottoms where they hide in shallow burrows under rocks. Females carrying eggs or young were found by Ortmann (1906) through most of the year (excepting only April, May and June), although few other of the details of its life history are known.

Procambarus clarkii (Girard) is included in the diet of one salamander and one turtle. It is a southern species ranging from Texas to Alabama on the Gulf Coast and as far north as southwestern Kentucky in the Mississippi valley. It is found in lowland situations, especially marshes, swamps, shallow ponds and ditches with muddy bottoms and vegetation upon which it feeds. The life history has been studied in detail by Penn (1943).

TABLE 2.—Frequency and volume of crawfishes in total food of game fishes.

SPECIES	FREQUENCY		VOLUME		Crawfish Species ^a	States Represented ^b	Authorities Cited.
	Total With Food	Total With Data	Total With Data	Percent			
<i>Salmo irideus</i>	231	227	64	28	4	17	26,46,54,84,89,92,93, 34,51,54,106,107.
<i>Salmo trutta</i>	101	101	2	2	10	2	15,39,50,51,54,56,58,82,83,84.
<i>Salvelinus fontinalis</i>	567	567	55	10	454	3	20,29,37,69.
<i>Coregonus clupeaformis</i>	63	32	0	0	63	1	11,15,18,20.
<i>Esox americanus</i>	10	— ^c	—	—	—	—	5,11,27.
<i>Esox lucius</i>	279	253	2	1	217	5	4,27.
<i>Esox niger</i>	249	249	65	26	249	25	15,23,29,37,52,59,65,68,69,78,87,99.
<i>Esox reticulatus</i>	35	35	4	12	35	14	73.
<i>Esox vermiculatus</i>	23	23	1	4	—	—	15.
<i>Perca flavescens</i>	3,671	1,944	124	6	2,970	4	9,14,15.
<i>Sizostedion vitreum</i>	1,131	—	—	—	1,131	Tr.	23,29.
<i>Micropterus dolomieu</i>	2,165	1,670	563	34	1,753	34	4,15,20,23,27,37,52,59,62,64,65,68, 69,70,77,78,86,87.
<i>Micropterus salmoides</i>	860	633	26	4	518	2	20,22,30,37,75,99.
<i>Lepomis cyanellus</i>	19	19	9	47	8	8	11,15,19,20,24,27,34,52,59,62,64,65, 68,69,77,78,79,86,88,94,99,105,108.
<i>Lepomis gibbosus</i>	140	131	5	4	108	Tr.	1,5,11,14,17,20,22,23,27,34,37,52, 53,59,64,65,68,69,78.
<i>Lepomis incisor</i>	223	—	—	—	223	1	27,37.
<i>Lepomis pallidus</i>	243	243	4	2	—	—	1,4,23,27,52,65,68,69,78.
<i>Chaenobrytus coronarius</i>	81	34	42	79	—	—	52,65,68,69.
<i>Ambloplites ariomus</i>	8	8	1	12	—	—	23,27,37,64,78.
<i>Ambloplites rupestris</i>	1,311	124	56	45	1,205	14	11,23,30,43,61.
<i>Pomoxis annularis</i>	2	—	—	—	2	5	104.
<i>Morone interrupta</i>	1,287	1,287	49	4	1,250	6	4,11,20,23,27,37,52,59,62,64,65,68, 69,77,78,86,87,99.
<i>Leptema chrysops</i>	14	14	4	29	4	0	87.
							15, 18,53,68.
							25, 52,59.

For explanation of reference marks see facing page.

^a Crawfish species: 1. *Orconectes propinquus* sssp., 2. *Orconectes virilis*, 3. *Cambarus robustus*, 4. *Cambarus diogenes* sssp., 5. *Orconectes immunis* sssp., 6. *Orconectes rusticus* sssp., 7. *Cambarus bartoni* sssp., 8. *Procambarus clarkii*, 9. *Procambarus fallax*, 10. *Procambarus spiculifer*, 11. *Orconectes limosus*, 12. *Orconectes obscurus*, 13. *Cambarus ludovicianus*, 14. *Procambarus pubescens* (?), 15. *Procambarus troglodytes* (?).

^b States represented: 1. Alabama, 2. Connecticut, 3. Florida, 4. Georgia, 5. Illinois, 6. Indiana, 7. Iowa, 8. Louisiana, 9. Maine, 10. Massachusetts, 11. Michigan, 12. Minnesota, 13. Mississippi, 13. New Hampshire, 15. New York, 16. Ohio, 17. Oklahoma, 18. Ontario, 19. Pennsylvania, 20. Quebec, 21. South Dakota, 22. Tennessee, 23. Texas, 24. Utah, 25. Virginia, 26. West Virginia, 27. Wisconsin.

^c Quantitative data not available.

Procambarus fallax (Hagen) is included in the diet of one frog and one snake. It is restricted to the peninsula of Florida from the Suwanee River south to Palm Beach County. Hobbs (1942b) stated that this species is not restricted to one particular habitat as long as there is sufficient vegetation to afford hiding places. He found it carrying eggs and young during most of the year although little else is known of the details of its life history.

Orconectes limosus (Rafinesque) is included in the diet of only the small mouth bass, *Micropterus dolomieu*. This crawfish occurs in the Coastal Plain from Connecticut to Virginia where it is the common river species of the lowlands, living in slow-flowing, mud-bottomed streams, canals and ponds. It may make shallow burrows in the mud banks or hide in aquatic vegetation. According to Andrews (1904) and Ortmann (1906) it spawns in late March and April, the young hatching in May. Ortmann has also given some other details of its life history.

Procambarus spiculifer (LeConte) is included in the diet of only one salamander, *Amphiuma tridactylum*. It ranges along the Gulf Coast from Mississippi to Georgia and Florida, living primarily in the riffles of clear, flowing streams in which the oxygen content is high. Little is known of its life history although Hobbs (1942b) found females carrying eggs in January, March and August.

Orconectes obscurus (Hagen) is included in the diet of only the queen snake, *Natrix septemvittata*. It ranges from eastern Ohio and northwestern New York to the panhandle of West Virginia and Alleghany County, Maryland. This is another river species, which is found principally in the larger streams where it may make shallow burrows under rocks or in gravelly banks. The spawning season is short; females carrying eggs or young were found in April, May and June by Ortmann (1906) who also recorded some other details of the life history.

Cambarus ludovicianus Faxon is included in the diet of only one salamander, *Amphiuma tridactylum*. Its range at present is poorly defined, but it is known from southeastern Louisiana and southern Mississippi. Its habitats are probably very similar to those of *C. diogenes*, although the details of its life history have not been studied.

TABLE 3.—Frequency and volume of crawfishes in total food of non-game fishes.

SPECIES	FREQUENCY			VOLUME		Crawfish Species ^a	States Represented ^b	Authorities Cited.
	Total With Food	Total With Data	Total With Crawfish	Percent	Total With Data			
<i>Lepisosteus osseus</i> spp.	173	173	3	2	173	1	5,6,11,18,27.	23,29,45,47,65,69,99.
<i>Lepisosteus platostomus</i>	110	107	7	7	21	17	5,6,7,22,27.	26,29,47,63,69,72.
<i>Lepisosteus productus</i>	38	38	2	5	5	Tr.	6,11.	47.
<i>Ania calva</i>	269	232	138	60	233	19	5,6,11,27.	11,16,29,30,43,45,48,52,65.
<i>Anguilla rostrata</i>	3	3	3	100	—	2.	5,15,27.	1,29,68.
<i>Ictiobus urus</i>	17	17	1	6	—	—	No data.	29.
<i>Cyprinus carpio</i>	10	10	1	10	10	2	No data.	69.
<i>Semotilus atromaculatus</i>	105	105	23	22	9	16	15,18,20.	4,21,34,50,84.
<i>Semotilus bullaris</i>	2	2	2	100	2	3.	15.	4.
<i>Leucosomus corporalis</i>	22	22	5	23	22	12	No data.	5.
<i>Lota maculosa</i>	1,378	1,378	12	1	1,378	Tr.	5,11,15,27.	4,29,69,103.
<i>Nocomis biguttatus</i>	13	13	2	15	13	22	No data.	28.
<i>Ictalurus punctatus</i>	154	136	2	2	79	2	5,15,22,27.	22,29,53,69,87.
<i>Ameiurus melas</i>	138	110	1	1	136	5	5,21,27.	8,26,65,69.
<i>Ameiurus lacustris</i>	2	2	2	100	—	—	18.	6.
<i>Ameiurus natalis</i>	78	63	6	10	73	10	1,5,11,15,27.	1,29,37,68,69,98.
<i>Ameiurus nebulosus nebulosus</i>	144	107	20	19	83	17	5,11,15,18,27.	4,29,37,52,62,68,69,77,78,86,88.
<i>Noturus flavus</i>	13	—	—	—	13	20	15.	87.
<i>Percina caprodes zebra</i>	58	58	3	5	5	3	6,15.	4,23.
<i>Etheostoma coeruleum</i>	8	—	—	—	8	12	No data.	100.
<i>Aplodinotus grunniens</i>	19	—	—	—	19	5	No data.	87.

^a See footnote *a* under Table 2. ^b See footnote *b* under Table 2.

TABLE 4.—Frequency and volume of crawfishes in total food of amphibians and reptiles.

SPECIES	Total With Food	FREQUENCY		VOLUME		Crawfish Species ^a	States Represented ^b	Authorities Cited.
		Total With Food	Total With Food	Total With Food	Total With Food			
<i>Necturus maculosus</i>	488	124	18	15	470	3/	11,15,19,27	35,44,67,68,97,
<i>Amphiuma means</i>	— ^c	—	—	—	—	1.	3.	12.
<i>Amphiuma tridactylum</i>	180	180	84	47	180	No data.	3,8.	12,13.
<i>Cryptobranchius alleganiensis</i>	67	67	60	90	3	No data.	19.	60,97.
<i>Rana catesbeiana</i>	95	95	25	26	5	No data.	5,15,19,	10,32,57,97.
<i>Rana clamitans</i>	626	626	29	5	519	No data.	15,19,	36,97.
<i>Rana grylio</i>	— ^c	—	—	—	—	No data.	3.	12.
<i>Rana pipiens pipiens</i>	342	306	2	77	36	No data.	16,17,24.	25,31,41.
<i>Rana pipiens phenocephala</i>	433	433	30	7	—	10,14,15.	3.	40.
<i>Alligator mississippiensis</i>	305	305	264	87	—	No data.	33.	33.
<i>Natrix erythrogaster erythrogaster</i>	1	1	1	100	—	No data.	5.	10.
<i>Natrix erythrogaster transversa</i>	3	3	1	33	—	No data.	No data.	85.
<i>Natrix grahamii</i>	— ^c	—	—	—	—	No data.	23.	90,91.
<i>Natrix septemvittata</i>	57	57	54	94	57	No data.	15,19,25.	3,76,85,95,101.
<i>Liodytes alleni</i>	164	164	107	65	164	12.	3.	12,102.
<i>Sternotherus odoratus</i>	143	143	10	7	139	9.	11,19.	42,96.
<i>Chelydra serpentina</i>	569	569	175	31	549	2.	2,10,11,12,15,19,26.	2,7,42,71,81,96.
<i>Glemmys guttata</i>	27	27	1	4	—	1,2,4,5,6.	19.	96.
<i>Glemmys insculpta</i>	26	26	1	4	—	No data.	19.	96.
<i>Emys blandingii</i>	92	92	73	78	92	No data.	11.	42.
<i>Terrapene carolina</i>	44	44	2	5	—	1,2.	5,19.	10,96.
<i>Graptemys geographica</i>	40	40	10	25	39	No data.	11,12,19.	7,42,96.
<i>Chrysemys picta marginata</i>	556	556	73	13	556	5.	11,15,19.	42,74,96.
<i>Pseudemys scripta troostii</i>	104	104	27	26	104	1,2.	8.	55.
<i>Amnyda spinifera</i> spp.	37	19	11	58	35	1,2,5,6.	11,12,19.	7,42,96.

^a See footnote a under Table 2. ^b See footnote b under Table 2. ^c See footnote c under Table 2.

Procambarus pubescens (Faxon) and *Procambarus troglodytes* (LeConte) were reported in the diet of *Rana sphenoccephala* by Kilby (40). According to Hobbs (1942b) neither of these species occurs in Florida where Kilby worked, raising the probability that his specimens were mis-identified.

It has also been suggested that crawfishes may be utilized in ways other than as food in fish management. Bonham (1946) expressed the thought that large crawfish populations might be capable of holding down undesirable

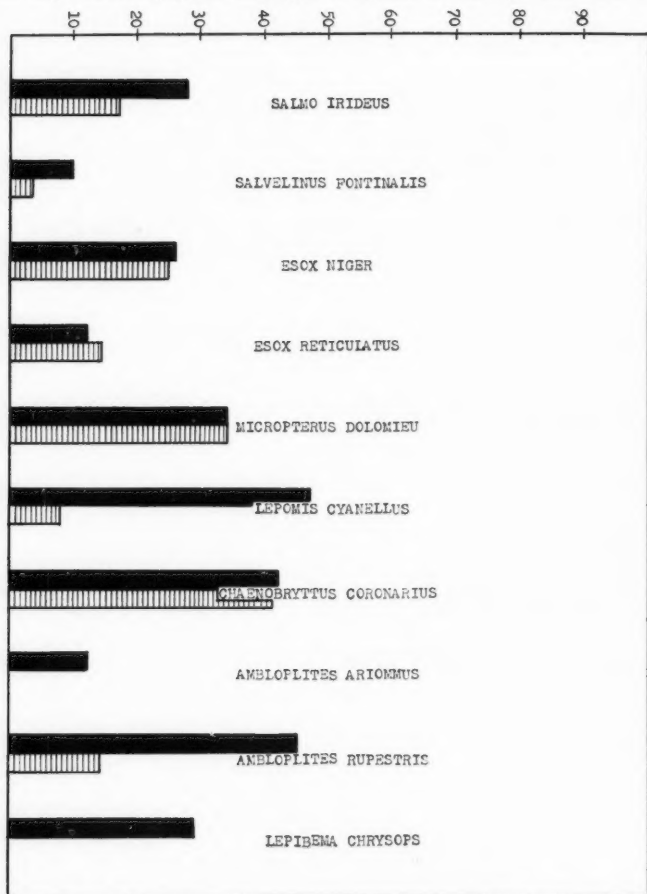


Fig. 1.—Graphic expression of frequency and volume of crawfishes in total food of game fishes. Solid bars represent percent frequency; shaded bars represent percent of volume.

bluegill sunfish populations. In Texas ponds he found that forty percent of the crawfishes (unidentified) over three inches in length were feeding on bluegill fry, and concluded that crawfishes thus "retarded overpopulation of the pond by bluegills." Actual experiments were not conducted, but this would become a very valuable management tool if proved true.

In the summarization of utilization by cold-blooded vertebrates which follow, the data have been grouped into three tables and three figures. Every

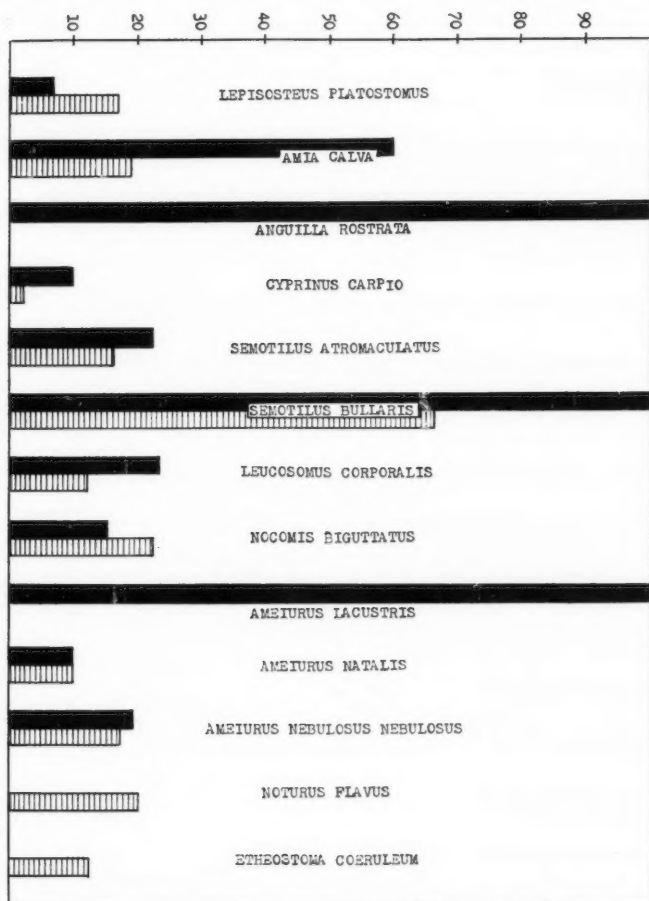


Fig. 2.—Graphic expression of frequency and volume of crawfishes in total food of non-game fishes. Symbols same as in fig. 1.

author has not given the same types of data: some have given figures for "percent occurrence" of the food item, others have given "percent of total food volume," and others have given both figures. The combination of these data therefore has necessitated two separate calculations dealing in almost every case with much less than the total "raw" data given by the authors.

Game fishes (Table 2, Fig. 1).—Although included in the diet of twenty-three species of game fishes, crawfishes are a staple item of comparatively few

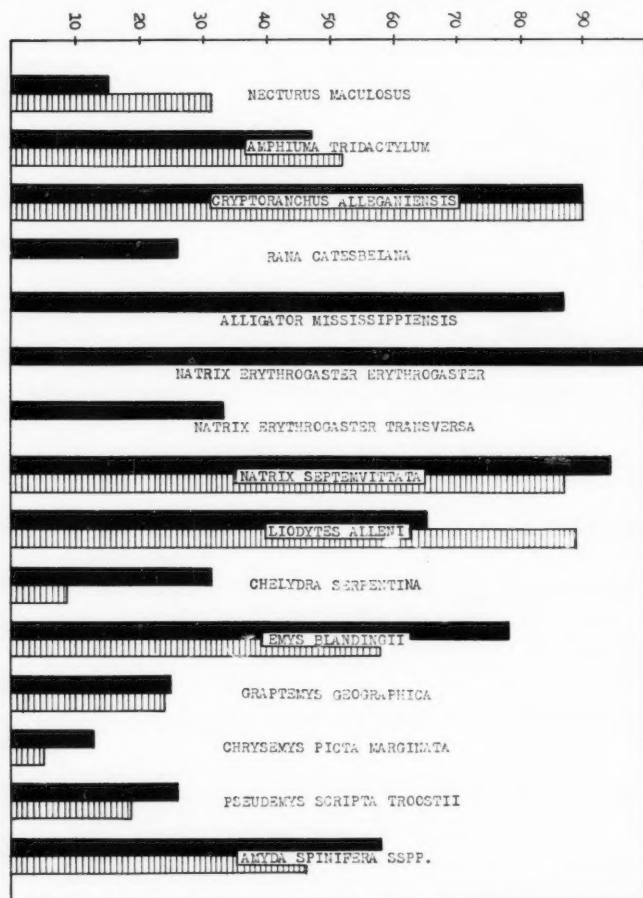


Fig. 3.—Graphic expression of frequency and volume of crawfishes in total food of amphibians and reptiles. Symbols same as in fig. 1.

species. It should be noted that the most popular sport fish of the North, *Micropterus dolomieu*, depends on crawfishes to a greater extent than any other game species. That this has long been recognized is apparent from the remarks of Reighard (78) who stated that there is "no doubt that in mid-summer the crayfish is the chief constituent of the food of the smallmouth bass in Douglas Lake," and Langlois (1937a) that in Ohio this fish subsists principally upon crawfishes during July and August. On the other hand, the food habits of its Southern counterpart, *Micropterus pseudaplites*, have been studied only in one of the Tennessee Valley Authority impoundments. Here, Dendy (22) examined 65 specimens, none of which had eaten crawfishes. However, crawfishes are notably scarce in the lake studied, and examination of small-mouth bass in other localities in the South will probably disclose a dependence on crawfishes similar to that of the northern species.

Non-game fishes (Table 3, Fig. 2).—Some of the percentages in the table are based on very small numbers of fishes examined. It is almost certain that additional studies will revise these figures considerably downward.

Amphibians and Reptiles (Table 4, Fig. 3).—While it is not unexpected that bottom dwelling species such as *Cryptobranchus alleganiensis* and *Amphiuma tridactylum* would include large numbers of crawfishes in their diet, it is surprising that the alligator and two species of snakes subsist largely on crawfishes. In the case of the alligator, however, it should be pointed out that the majority of the specimens examined were under four feet in total length.

SUMMARY

A review of 108 papers on food habits of fishes, amphibians and reptiles in eastern United States points to the importance of crawfishes in the diet of some of these animals. Knowledge of the productivity and reproductive potential of crawfishes is given along with brief notes on each of the twelve most important species indicated in the food habits studies reviewed. The need for additional work on crawfishes in order that they be utilized to fullest advantage in wildlife management is stressed.

REFERENCES

The reference material has been divided into two groups: Part I. General, i.e. those papers which include qualitative data on utilization and habits of crawfishes, and Part II. Specific, i.e. those which contain quantitative data on food habits of cold-blooded vertebrates.

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A Survey of the Insects of White Sands National Monument, Tularosa Basin, New Mexico¹

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INTRODUCTION

Most of the insects reported here were collected in and around White Sands National Monument between June 5, 1947 and August 9, 1947. There are a few records from collections made June 20-21, 1946 and records of two species furnished by other collectors. A large number of records of other arthropods will be reported in a subsequent paper.

The White Sands National Monument is situated in Tularosa Basin (Fig. 1), an area of internal drainage bounded on the east and west by a series of fault ranges and by relatively high ground on the north and south. The chief deposit of the basin is valley fill. In addition to the White Sands, there are several other large areas of ecological importance. West of the White Sands and adjacent to that area is a large salt flat. At the south end of this flat is an intermittent salt lake, Lake Lucero. North of the White Sands and not quite contiguous with that area is the "malpais," a recent lava deposition. South of the White Sands and separated from it by a distance of about 20 miles is a large area of reddish silica dunes. This dunes area surrounds the low Jarilla mountains and extends into the Hueco Basin to the south.

The White Sands National Monument (Fig. 2) includes a part of an almost unique type of habitat, consisting of dunes of fine crystalline gypsum, some as high as 50 feet, alternating with "flats" or level inter-dunal areas. The substrate of the southern part of this area is composed almost entirely of calcium sulfate. In the northern part there is much more admixture of silica and other materials. The geological history of the White Sands deposit has been studied by Vandiver (1936), Potter (1938) and others.

Biotic conditions in the White Sands are of great interest. Since Dice (1929, 1930) described and discussed the light-colored race of pocket mouse, *Perognathus apache gypsi*, which shows evident color adaptation to the substrate, interest has been focused on organisms showing coloration adaptation. Benson (1933), Blair (1941, 1941a, 1943) and others have contributed to our knowledge of the mammals of the area. Smith (1943) has described a light-colored subspecies of lizard, *Holbrookia maculata ruthveni* from the White Sands. A white toad identified as *Scaphiopus couchii* has been reported, (Stroud 1949). Bugbee (1942) made brief notes on animals of the

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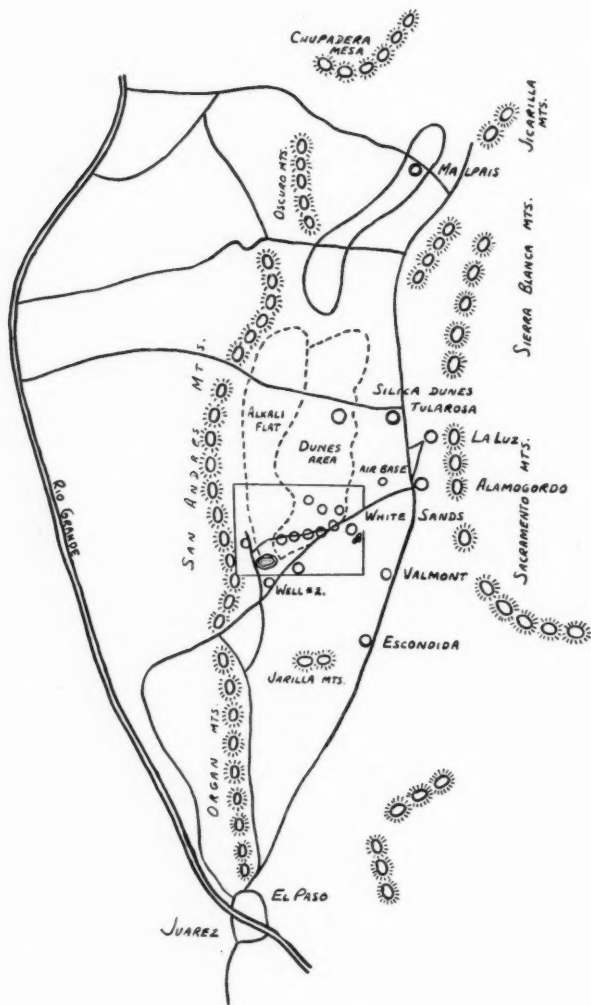


Fig. 1.—Tularosa Basin.

area including some arthropods. Strohecker (1947) described as new species two white Gryllacrididae belonging to the genera *Dahiniodes* and *Ammobaenetes*. Emerson (1935) studied the flowering plants of the White Sands and noted that "numbers of both species and individuals gradually decrease with increasing distance from the general desert."

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DESCRIPTION OF LOCALITIES

In the present study collections were made at nine sites inside the white dunes area and at thirteen localities outside of it. The locations collected are indicated in figures 1 and 2. Figure 2 is an enlargement of the portion of figure 1 inclosed by a rectangle.

The locality "Loop Drive" is about ten miles from the monument entrance and is seven miles from the nearest frontal dunes. The area is representative of the climax of dune action. The flats are largely covered with gypsum and are almost entirely devoid of vegetation. The most common plant is sand bunch grass, *Oryzopsis hymenioides*. The dunes are very high and are quite active.

The locality "Picnic Area" is five miles from the Loop Drive and the same distance from the area designated "Ridingers." It is an area of large active dunes but the average concentration of plants in the flats is greater than that found in the Loop Drive area. Outstanding additions to the flora are *Yucca* and *Chrysothamnus*. At two places in the area there are groups of *Populus*.

"Ridingers" is a site on the margin of the dunes area two miles south southwest of the monument entrance. Collections were made in the frontal dunes and for a distance of about a mile into the dunes area. The frontal dunes are especially high above the surrounding desert at this point. The flora of the extensive flats and low dunes to the west of the frontal dunes consists of a number of species in addition to those found in the more central locations. *Yucca*, *Tamarix*, *Ephedra*, *Chrysothamnus*, and *Rhus*, are particularly abundant. Considerable numbers of pedestals are found here, formed of packed gypsum under groups of plants, especially *Rhus*.

The area near the "Entrance" to the White Sands National Monument is very much like that at Ridingers and served as a check on collections made at the latter location. The stands of vegetation are approximately equal in the two areas.

Small collections were made at points five, ten, and fifteen miles west southwest of Ridingers. The dunes are low in these areas and are almost entirely stabilized by plants and by the admixture of darker soil, but there are scattered active dunes.

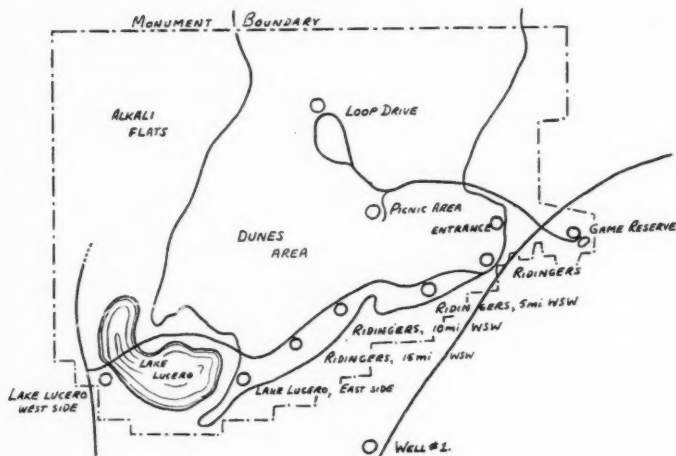


Fig. 2.—White Sands National Monument.

Lake Lucero, about twenty miles west southwest of Ridingers is the remnant of the "old salt lake" which once occupied at least the entire area of the present "Salt flats." The west side of Lake Lucero is ecologically much different from the White Sands area. There are no dunes and the dominant plant is *Prosopis*. The east side has many gypsum dunes and pedestals. The substrate is formed of much larger crystals than that of the rest of the White Sands dunes area.

Collections were made in an area designated "Silica Dunes," about ten miles west of Tularosa. This is within the northern portion of the same dunes area found at White Sands, but here the soil is considerably darker due to the admixture of silica and other materials. The vegetation is much like that at Ridingers, except for the addition of *Prosopis*.

KEY TO ABBREVIATIONS AND SYMBOLS

- Localities
(Within principal dunes area)
1. Loop Drive
 2. Picnic Area
 3. Ridingers
 4. Entrance
 5. 5 mi. WSW of Ridingers
 6. 10 mi. WSW of Ridingers
 7. 15 mi. WSW of Ridingers
 8. E. side of Lake Lucero
 9. Silica Dunes
- (Outside principal dunes area)
10. Game Reserve

11. Well No. 1, Baird's Ranch
12. Well No. 2, Baird's Ranch
13. S. of Lake Lucero
14. W. side of Lake Lucero
15. 2 mi. S. of Alamogordo
16. Dunes near Valmont
17. Red Dunes near Escondida
18. 2 mi. N. of La Luz
19. Alamogordo Army Air Base
20. Malpais, W. of Carrizozo
21. Knoll in Malpais
22. Tularosa

Habitats and Methods of Collection
(Letters indicate specific plants)

- A. *Yucca elata* Engelm. Yucca, Palmilla
B. *Populus wislizeni* Rio Grande Cotton-wood
C. *Tamarix gallica* Salt Cedar
D. *Cucurbita foetidissima* Wild Gourd
E. Various Grasses
F. *Abronia augustifolia* Sand Verbena
G. *Atriplex canescens* Four-Winged Salt Bush
H. Various small Compositae

(Numbers indicate collection data)

1. Collected by light trap at night
2. Collected in molasses traps left over-night
3. On dune surface
4. In human habitation
5. On surface of inter-dunal flat
6. Parasitic on other Arthropods

Months

- A. June 19-20, 1946
6. June 5-30, 1947

- I. *Andropogon carnosus* Waterleaf
J. *Nerisyrenia linearifolia* Pepper Plant
K. *Chrysothamnus nauseosus* var. *latis-quameus* Rabbit Brush
L. *Anogra gypsophila* Evening primrose
M. *Opuntia* sp. Stick Cactus
N. *Mentzelia pulmilla* var. *procera* Stickle Weed
O. *Koerberlinia spinosa* Allthorn
P. *Prosopis* sp.
Q. *Larrea tridentata* Creosote Bush
R. *Ephedra torreyana* Joint-fir

7. Dug out of soil
8. Captured in nuptial swarm
9. Near termite nest
10. In orchard
11. On reddish brown earth
12. On vegetation
13. In rubbish heap
14. Near pond

7. July 1-31, 1947

8. Aug. 1-9, 1947

TABLE 1.—Insects collected

Species	Localities	Months	Habitats	Number
Orthoptera				
LOCUSTIDAE				
<i>Acroplides elegans</i> (Scudder)	3,7	7,8	E,G,I	9
<i>Anconia hebardii</i> Rehn	10	6		1
<i>Allocara elliotti</i> (Thomas)	2	6		1
<i>Boottettix argentatus</i> Bruner	18	7	Q	2
<i>Cibolacris parviceps arida</i> (Br.)	4,5,18	6,7	3,11	25
<i>Cordillacris occipitalis cinerea</i> (Br.)	3	6,7	3,5	6
<i>Derotmena haydeni laticinctum</i> Sc.	3,5	7	3	7
<i>Eremiacris acris</i> Rehn & Hebard	3	6,7	3,5	8
<i>E. virgata</i> (Sc.)	5	7		1
<i>Goniatron planum</i> Br.	12	7	G,O,P	5
<i>Melanoplus bowditchi</i> Sc.	3	7,8	G,I	2
<i>Paropomala wyomingensis</i> (Thos.)	3	6,7,8	E,5	4
<i>Pedioscirtetes maculipennis</i> (Sc.)	3,5	7	3	2
<i>Psoloessa d. delicatula</i> Sc.	14	6		2
<i>Schistocerca lineata</i> ? Sc.	3	8	1	2
<i>Spharagemon collaris</i> (Sc.)	3	8	1	1
<i>Trimerotropis citrina</i> Sc.	3,5	7,8	1,3	8
<i>T. p. pallidipennis</i> (Burm.)	1,3,4,10, 14,17	6,7,8	1,2	20
<i>T. pistrinaria</i> Saussure	3	8	1	2
<i>T. strenua</i> McNeill	3,10	8	1	7
<i>T. texana</i> Br.	2,3,4	6,7,8	1	9
<i>Xanthippus c. corallipes</i> (Thos.)	2	6		1
TETTIGONIIDAE				
<i>Eremopedes scudderii</i> Cockerell	3,9	7	A,P,I	5
<i>Insara e. elegans</i> (Sc.)	3	7	G	4

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
GRYLLACRIDIDAE				
<i>Ammobaenetes phrixocnemoides</i> (Caudell)	17	8	2	10
<i>A. p. arenicolus</i> (Strohecker)	1,2,3,9	6,7,8	2,3	400
<i>Ceuthophilus</i> n. sp.	20	7	2	12
<i>C. sp.</i>	2,3,15	6,7	2	3
<i>Daibiniodes hastiferum</i> (Rehn)	3,10,18	6,7	2	40
<i>D. h. larvale</i> (Stroh.)	1,2	6,7	2	91
GRYLLIDAE				
<i>Acheta assimilis</i> Fabricius	3,6,11,12	7	2,4,13	9
BLATTARIA—CORYDIIDAE				
<i>Arenivaga erratica</i> Rehn	9,16,17	7,8	2	18
<i>Eremoblasta subdiaphana</i> (Sc.)	18	7	2	1
PHASMIDA—PHASMIIDAE				
<i>Diapheromera velii eucnemis</i> Hebard	3,9	7	A,G,3	6
MANTODEA—MANTIDAE				
<i>Stagmomantis californica</i> Rehn & Hebard	3	8	1	1
Isoptera				
RHINOTERMITIDAE				
<i>Reticulitermes tibialis</i> Banks	2,3	6,7	7	
Odonata				
COENAGRIIDAE				
<i>Argia alberta</i> Kennedy	10	7,8	14	6
<i>Enallagma civile</i> (Hagen)	10	7,8	14	4
<i>Ischnura barberi</i> Currie	1,10	7,8	12,14	5
AESCHNIDAE				
<i>Aeschna multicolor</i> Hagen	10	7	14	5
Hemiptera				
CYDNIDAE				
<i>Thyreocoris</i> nr. <i>extensus</i> Uhler	3	7	E	1
PENTATOMIDAE				
<i>Chlorochroa sayi</i> Stal.	3,4,9	6,7	A,R	22
<i>C. uhleri</i> Stal.	4	6	R	6
<i>Murgantia histrionica</i> (Hahn)	1,2	6,7	A	3
<i>Peribalus limbolarius</i> Stal.	1	7		1
<i>Frionosoma podopides</i> Uhl.	1	7		1
<i>Thyanta brevis</i> Vand.	3	6	G	1
<i>T. custator</i> (Fav.)	3,10	8	1	23
<i>Zicrona caerulea</i> (Linn.)	1,2,5	6,7	A,G	6
COREIDAE				
<i>Chariesterus cuspidatus</i> Dist.	1	7		1
<i>Chelinidea</i> sp.	20	7	2	1
<i>Leptoglossus clypealis</i> Heid	3	8	1	2
CORIZIDAE				
<i>Harmostes reflexus</i> (Say)	2,3	7,8	R,3	3
<i>Mecidea minor</i> Ruckes	1,3	7,8	1	3
LYGAEIDAE				
<i>Geocoris pallens</i> Stal.	1	6	E	2
<i>Ligyrocoris nitidula</i> Uhl.	10	8	1	1
<i>Liorhyssus hyalinus</i> (Fav.)	3	8	1	1

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
<i>Lygaeus kalmii</i> Stal.	1,3	7,8	1	2
<i>L. lateralis</i> Dall.	3,10	7,8	1,3	18
<i>Nysius californicus</i> Stal.	3,4	6,8	G,1	2
<i>N. monticola</i> Dist.	1	7	E,F	2
<i>N. raphanus</i> Howard	1,4	6,7	A,E	2
TINGIDAE				
<i>Corythucha morrilla</i> Osb. & Dr.	2	6	K	3
NABIDAE				
<i>Nabis alternatus</i> Parsh.	10	6	E	1
ANTHOCORIDAE				
<i>Orius latulus</i> ? Reut.	3	6	G	5
<i>O. tricolor</i> (White)	3	6	G	1
MIRIDAE				
<i>Chlamydatus</i> sp.	1			
<i>Hadronema</i> sp.	3			
<i>Halticus bractatus</i> (Say)	4	6		1
<i>Lygus olisus</i> V.D.	1,2,3			
<i>Orthotylus</i> sp.	2			
<i>Polymerus basalis</i> var.	1,3			
<i>Phytocoris ramosus</i> (Uhl.)	3	8	1	
<i>P. vividus</i> (Uhl.)	3	8	1	
<i>Rhinocloa forticornis</i> Reut.	2,4			
Genus? sp.?	3			
NOTONECTIDAE				
<i>Notonecta</i> sp.? near <i>indica</i> Linn.	2	6		1
FULGORIDAE				
<i>Acanatonia parva</i> Doering	4	6		3
<i>Hysteropterum unum</i> Ball	2	6,8	K	7
<i>Orgerius foliatus</i> Doering & Darby	3,4	6,7	G	9
DELPHACIDAE				
<i>Prokelisia salina</i> (Ball)	3	8	E	1
CIXIIDAE				
<i>Cixius</i> sp.	4	6	G	7
Genus ? sp.?	2,3,4,10	6,7	A,E,G	51
CICADIDAE				
<i>Beamieria wheeleri</i> Davis	3,13	7	E	2
<i>Diceroprocta vitripennis</i> (Say)	2,3,4,9,14	6,7	A,G,P	40
<i>Tibiceri townsendi</i> Uhl.	3	7	A	2
MEMBRACIDAE				
<i>Centrodontus atlas</i> (Godg.)	1,3	6,7	E,F	2
CERCOPIDAE				
<i>Clastoptera</i> sp.	2	8	K	1
CICADELLIDAE				
<i>Aceratagallia abrupta</i> Oman	1,2	6,7,8	E,F,K,R	16
<i>Acinopterus</i> sp.	1,2	6,7,8	F,K	3
<i>Atahysanella (Gladioneura) concava</i> Ball & Bmr.	10	6	E	3
<i>Cuerna</i> sp.	4	6	A	2

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
<i>Doleramus</i> sp.	4	6	K	4
<i>Empoasca</i> sp.	2	7	K	1
<i>Exitianus obscurinervis</i> Stal.	3	8	1	4
<i>Lonatura salsura</i> Ball	10	6	E	1
<i>Nesosteles</i> sp.	1	7	E	2
<i>Ollarianus</i> sp.	1,3	6,7	E,G	2
<i>Opsius stetogalus</i> Fied.	3	8	1	7
<i>Parabolocratrus viridis</i> ? V.D.	10	6	E	1
<i>Paraphlepsius denudatus</i> (Ball)	4,17	6,8	G,2	2
<i>Stragania</i> (<i>Penestrangania</i>)				
<i>robusta</i> (Uhl.)	3	6	G	1
<i>Sigara alternata</i> (Say)	3	8	1	1
APHIDIDAE				
<i>Aphis helianthi</i> Morell	2,4	6	A	
<i>Capitophorus stroudi</i> Knowlton	2	8	K	
Neuroptera				
CHRYSIDAE				
<i>Chrysopa excepta</i> (Banks)	10	8	1	1
<i>C. harrisii</i> (Fitch)	3	7,8	1,4	2
<i>C. nigricornis</i> (Burm.)	9	7	2	1
<i>Chrysopiella sabulosa</i> (Banks)	10	8	1	1
<i>Eremochrysa punctinervis</i> (McLach)	3,10,17,20	6,7,8	G,1,2	12
MYRMELEONIDAE				
<i>Hesperoleon abdominalis</i> (Say)	1	7	E	1
<i>H. minusculus</i> (Banks)	2,3,9,10, 16,17,20	6,7,8	A,E,N,1,2	19
<i>H. tenuis</i> Banks	10	8	1	1
<i>Myrmeleon crudelis</i> (Walk.)	3	8	1	1
<i>Paranthracis hageni</i> (Banks)	3	6,8	1	19
<i>Puren inscriptus</i> (Hagen)	3	7,8	1	4
<i>Scotoleon longipalpus</i> (Hagen)	3	6	1	1
Lepidoptera				
COLEOPHORIDAE				
Genus? sp.?	3	6	G	
PRODOXIDAE				
<i>Tegeticula alba</i> Zeller	2,9	6,7	A	5
EUCHROMIIDAE				
<i>Ctenucha venosa</i> Walker	1,3,7	7	C,0	5
NOCTUIDAE				
<i>Bulia deducta</i> Morr.	2	6	A	2
<i>B. d. fm. vulpina</i> Hy. Edw.	2	6	A	1
<i>Erebis odora</i> L.	3	7	1	3
SPHINGIDAE				
<i>Celerio lineata</i> Fav.	2,3	6,7	A,1	3
<i>Pachysphinx modesta imperator</i> Skr.	3	8	1	1
<i>Phlegethontius quinquemaculata</i> Haworth	3	7,8	1	3
HESPERIIDAE				
<i>Hesperia neskei</i> Edw.	3	7	C	1
<i>Pyrgus communis</i> Grt.	3	7	1	1

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
PAPILIONIDAE				
<i>Papilio bairdii</i> Edw.	7	7	3	2
<i>Colias eurytheme</i> fm. <i>amphidosa</i> BDV. ..	3	7	3	2
<i>Eurema nicippe</i> Cramer	3	7	I	5
<i>Pieris protodice</i> Bdv. & Lec.	3,10	6,7		2
DANAIDAE				
<i>Danaus berenice strigosa</i> Bates	3	7	c	1
NYMPHALIDAE				
<i>Euptoieta claudia</i> Cramer	3	7	5	3
<i>Phyciodes picta</i> Edw.	3	7	c	1
LYCAENIDAE				
<i>Hemiargus isola</i> Reak.	3	7	c	3
<i>Leptotes marina</i> Rak.	2,3	6,7	c	3
<i>Strymon melinus</i> Hbn.	3,10	6,7	c	5
Coleoptera				
CICINDELIDAE				
<i>Cicindela chihuahuae</i> Bates	10	8	1	1
<i>C. knausi</i> Leng	3,10	8	1	3
<i>C. lemniscata</i> Lec.	3,10	8	1	15
<i>C. lepida</i> Dej.	1,2,3	A,6,7,8	3	30
<i>C. praetextata</i> Lec.	3,10	8	1	16
<i>C. togata</i> (Recorded by H. F. Strohecker)	4	A	3	1
CARABIDAE				
<i>Bembidion bifossulatum</i> (Lec.)	3	7		2
<i>B. nr. striola</i> (Lec.)	3	7		1
<i>Diplochaetus lecontei</i> Horn	14	6	2	25
HYDROPHILIDAE				
<i>Berosus infuscatus</i> Lec.	4,10	8	1	3
<i>Hydrous triangularis</i> (Say)	3	7		1
SILPHIDAE				
<i>Necrophorus marginatus</i> Fab.	3	7		1
HISTERIDAE				
Genus? sp.?	2	6		1
LYCIDAE				
<i>Lycus fernandesi</i> Dug.	18	6	10	1
MELYRIDAE				
<i>Attalus nr. demissus</i> Fall	3	6	G	1
<i>Collops limbellus</i> G. & H.	3	8	E	1
<i>C. vittatus</i> (Say)	3	7	E	2
<i>Trichochrous</i> sp.	3	6	G	1
CLERIDAE				
<i>Cymatodera brunnea</i> Spin.	1	7		1
<i>C. sp.</i>	20	7	2	1
<i>Enoclerus abdominalis</i> var. <i>spinolae</i> (Lec.)	2,3,9,10	6,7	A	24
ELATERIDAE				
<i>Agrypnus scotti</i> Lec.	18,20	7	2	13
<i>Conoderus vespertinus</i> (Fav.)	2,3	6,7		2

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
<i>Drasterius</i> sp.	10	6	2	6
<i>Esthesopus</i> sp.	3	7	1,3	5
<i>Lacon rectangularis</i> (Say)	20	7	2	9
<i>Melanotus</i> sp.	20	7	2	5
<i>Neotrichophorus arizonensis</i> Schffr.	3,17,20	7,8	A,1,2	5
Genus? sp.?	3	7	1	2
BUPRESTIDAE				
<i>Acmaeodera delumbris</i> Horn	6	7		1
<i>Chrysobothris ulkei</i> Lec.	3,9	7	G	2
<i>Hippomelas planicosta</i> (Lec.)	2,3,4,9,10	A,6,7	C,G	10
DERMESTIDAE				
<i>Dermestes marmoratus</i> Say	3	8	1	6
<i>Trogoderma obsolescens</i> Cs.	1	7	E	1
LATHRIDIIDAE				
Genus? sp.?	14	6	J	1
COCCINELLIDAE				
<i>Chilocorus cacti</i> Linn.	3	7		1
<i>Hippodamia convergens</i> Guer.	1,2,3, 4,10	6,7,8	A,B,C,E, G,1,3	42
<i>H. 5-signata</i> ?	2	6	B	1
<i>Hyperaspis</i> nr. <i>annexa</i> Lec.	2	6	A	1
<i>H. fimbriolata</i> M.	2	6	E,F	2
<i>H. nr. gemma</i> Csy.	3,4	6	G	3
<i>Olla abdominalis</i> Say	2,3	6	A	2
<i>Scymnus</i> spp.	2,4	6	A,K	4
OEDMERIDAE				
<i>Oxacis sonora</i>	3,4,10	6,7,8	G,1	53
<i>O. sp.</i>	3,10	8	1	2
Genus? sp.?	1,3,10	7,8	1	4
MORDELLIDAE				
<i>Anthobates fuscus</i> Lec.	3	6	G	5
<i>A. pallens</i> Lilj.	3	6	G	12
<i>A. pallidus</i> Lilj.	3	6	G	6
<i>Mordellistena</i> sp.	2	6	A	1
MELOIDAE				
<i>Cysteodemus wislizeni</i> Lec.	3	8		4
<i>Epicauta atrivittata</i> (Lec.)	3	8	1	1
<i>E. funebris</i> Horn	20	7		1
<i>E. nogales</i> Werner	2,3	A,6	G	6
<i>E. pardalis</i> Lec.	1	A,7		2
<i>E. tenella</i> (Lec.)	10	8	1	1
<i>E. virgulata</i> (Lec.)	3,10	8	E,1	11
<i>E. sp.</i>	10	8	1	2
<i>Pleuropompha costata</i> Lec.	10	8	1	1
<i>Pyrota akhurstiana</i> Horn	3	8	1	4
<i>P. m-labrina</i> Chev.	3	8	1	4
<i>Zonitis</i> n. sp.	3	8	1	2
ANTHICIDAE				
<i>Anthicus</i> nr. <i>obliquus</i> Csy.	10	6	2	3
<i>A. spp.</i>	2,3	6	G,5	2

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
<i>Mecynotarsus candidus</i> Lec.	9	7	2	3
<i>Notoxus apicalis</i> Lec.	10	8	1	9
<i>Tanarthrus</i> sp.	10	6	2	3
ALLECULIDAE				
Genus? sp.?	3,4	7,8	1	3
TENEBRIONIDAE				
<i>Blapstinus</i> ?	3	6		17
nr. <i>Cnemodinus</i>	9,13	7	2	23
<i>Discodemus reticulatus</i> (Say)	2,3	6,7,8	2,3,7	30
<i>Eleodes acuta</i> (Say)	2,3,9	6,7		13
<i>E. caudifera</i> Lec.	2,3	A,6		18
<i>E. hispilabris</i> (Say)	2,3,16,17	A,6,7,8	2,7	78
<i>E. longicollis</i> Lec.	20	7		1
<i>E. obsoleta</i> (Say)	1,2,10	6,7	2	8
<i>Embaphion contusum</i> Lec.	1,2,3,4, 9,17	6,7,8	2,3,7	17
<i>Glyptasida sordida</i> (Lec.)	1,3,17	7,8		3
<i>Metoponium</i> spp.	9,16	7,8	2	12
<i>Zopherinus</i> sp.	3	6	3	1
MONOMMATIDAE				
<i>Hyporhagus gilensis</i> Horn	16	8	2	1
BOSTRICHIDAE				
<i>Amphicerus bicaudatus</i> (Say)	3	7		1
SCARABAEIDAE				
<i>Aegialia</i> sp.	2	6		1
<i>Coenonycha</i> sp.	1	7		1
<i>Cotinis texana</i> Csy.	15	7	2	2
<i>Dichromina dimidiata</i> Burm.	3	8	1	1
<i>Diplotaxis belfragei</i> var. <i>sinuata</i> Fall	3,10	7,8	1	40
<i>D.</i> sp. nr. <i>sinuata</i> Fall	3	8	1	2
<i>D. subangulata</i> var. <i>californica</i> Schaeef. ..				
<i>D.</i> spp.	2,3,9	6,7		12
<i>Euethiella rugiceps</i> Lec.	3	7,8	1	4
<i>Ochrosidia</i> sp.	3	7	1	4
<i>Podolasia ferruginea</i> (Lec.)	3	6		5
<i>Thyce squamicollis</i> Lec.	3	7	1	20
TROGIDAE				
<i>Trox punctatus</i> Germ.	2	6		1
<i>T. scutellaris</i> Say	2,3,6	6,7	3,5,7	14
CERAMBYCIDAE				
<i>Aneflus cochisensis</i> Csy.	9	7		1
<i>Anetlomorpha</i> sp.	20	7	2	1
<i>Batyloema pearsalli</i> (Bland)	2,4	6	H	2
<i>Crossidius intermedius</i> Lec. (Recorded by J. N. Knull)	3	8		
<i>Derochrus geminatus</i> Lec.	3	7,8	1,3	8
<i>Monilema</i> sp.	7	7	M	1
<i>Prionus curvatus</i> Lec.	3	7,8	1,3	4
<i>Stenaspis solitaria</i> (Say)	9,12,17	7,8	A	7
<i>Tragidion armatum</i> Lec.	2	6,7	A	17

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
CHRYSEMELIDAE				
<i>Diabrotica trilineata</i> (Say)	4	6	G	1
<i>Holtica foliacea</i> Lec.	1,2,3	A,6,7,8	E,L,1,3	70
<i>Luperodes</i> nr. <i>nigrovirens</i> F.	2	8	K	1
<i>Monoxia consputa</i> Lec.	2,3	6,8	G,K	4
<i>Myochrus longulus</i> Lec.	10	6	E	5
<i>Pachybrachys</i> nr. <i>minor</i> Bowd.	3	6	G	5
BRUCHIDAE				
Genus? sp.?	1,2	6,7	A,E	2
CURCULIONIDAE				
<i>Calendra</i> sp.	3,15	6,7	E,5	3
<i>Cleonaspis</i> sp.	3	7		1
<i>Dyslobus</i> sp.	3	8	I	1
<i>Eupagoderes cretaceus</i> Sharp	2	6,7,8	N,1	20
<i>E. decipiens</i> (Lec.)	18	7	Q	1
<i>E. wickhami</i> Sharp	3,4	6,7	G,3	16
<i>E. sp.</i>	8	7		1
<i>Panscopus</i> sp.	9	7	2	1
<i>Scyphophorus yuccae</i> Horn	4	6	A	1
Genera? spp.?	2,4	6,7,8	E,G,H,K,	8
Hymenoptera				
ICHNEUMONIDAE				
<i>Cremastus</i> n. sp.	2	6	B	1
<i>Ophion</i> n. sp.	3	8	C	1
BRACONIDAE				
<i>Bassus gibbosus</i> Say	2	6	F	2
<i>Chelonus</i> n. sp.	3	8		1
<i>Hormius</i> sp.	3	6	G	1
<i>Iphiaulax</i> spp.	3	7	C,G	2
<i>Orgilus</i> sp.	2	6	B	1
<i>Zelomorpha arizonensis</i> Ashm.	3	8	I	1
CHALCIDIDAE				
<i>Catolaccus aeneoviridis</i> Gir.	3	6	6	1
<i>Spilochalcis side</i> (Wlk.)	3	6	6	2
CALLIMOMIDAE				
<i>Torymus</i> sp.	4	6	G	1
TETRASTICHIDAE				
<i>Tetrastichus</i> sp.	3	6	6	8
ELACHERTIDAE				
(Elachertini) Genus? sp.?	1	7	F	1
FORMICIDAE				
<i>Aphaenogaster</i> (A.) <i>boulderensis</i>				
var. <i>M. R. Smith</i>	20,21	7	2	
<i>Camponotus acutirostris</i> Wheeler	20,21	7	2	
<i>C. vafer</i> Wh.	15,20	7	2	
<i>Crematogaster punctulata depilis</i> Wh.	3,12,18	7	2,5	
<i>C. sp.</i>	2	7	7	i
<i>Dorymyrmex pyramicus</i> (Roger)	12,14,15, 18,22	7	2	
<i>D. p. bicolor</i> Wh.	2,3,4,9,12, 15,16,17	7,8	2,5	

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
<i>D. p. niger</i> Pergande	21,22	7	2	
<i>Forelius maccooki</i> (Forel)	12,14,15, 20,21,22	6,7	2	
<i>F. sp.</i>	17	8	2	1
<i>Formica perpilosa</i> Wh.	2,3,9,15	6,7	A,F,G,K,2	1
<i>F. sp.</i>	3	7	8	7
<i>Iridomyrmex pruinosus</i> (Roger) var.	1,3,10, 14,21	6,7	2	
<i>I. p. analis</i> (André)	3,5	7	2	
<i>I. p. testaceus</i> Cole	17,18	7,8	2	
<i>I. sp.</i>	1,14	6	A,E	
<i>Lasius niger neomiger</i> Emery	3	6	2,9	
<i>Liometopum apiculatum</i> Mayr	14	6		
<i>Myrmecocystus melliger</i> Forel	20	7	2	
<i>M. m. mendax</i> Wh.	21,22	7	2	
<i>M. m. semirufus</i> Emery	17	8	2	
<i>M. mexicanus navajo</i> Wh.	3,5,15,17, 18,20	6,7,8	2	
<i>Novomessor cockerelli</i> (André)	3,14,18	6,7	2	
<i>Pheidole</i> (<i>Cerotropheidole</i>) sp.	20	7	2	
<i>P. desertorum</i> Wh. var.	20,21	7	2	
<i>P. hyatti</i> Emery var.	22	7	2	
<i>P. spp.</i>	1,12,16,17, 18,20	7,8	2	
<i>Pogonomyrmex barbatus marfensis</i> Wh. ..	15	7	2	
<i>P. californicus</i> (Buckley)	16	8	2	
<i>P. c. estebaninus</i> pergande	3	7	2	
<i>P. c. longinodis</i> Emery	18	7	2	
<i>P. c. maricopa</i> Wh.	1,15,21	6,7	2	
<i>P. occidentalis</i> (Cresson)	1	7		
<i>P. sp.</i>	3	7	8	
<i>Solenopsis molesta</i> (Say)	2	7	7	
<i>S. spp.</i>	3,15	7	2	
SPHECIDAE				
<i>Cerceris argyrotricha</i> Roh.	3	6,7	A,C	6
<i>C. rufinoda</i> Cr.	3	7	C	1
<i>C. spp.</i>	3	7	C	3
<i>Chlorion ashmeadi</i> Fern.	2,3	7	A,C	3
<i>C. atratum</i> (Lep.)	3	7	C	14
<i>C. aztecum</i> (Sauss.)	3	7	C	1
<i>C. cyaneum</i> (Dahlb.)	3	6,7	A	4
<i>C. thomae</i> (F.)	3	7	C	2
<i>Eucerceris bitruncata</i> Sc.	3	7	C	1
<i>E. canaliculata</i> (Say)	3	7	C	1
<i>E. montana</i> Cr.	3	7	C	1
<i>E. tricolor</i> Ckll.	3	7	C	1
<i>Hoplisoides confertus</i> (Fox)	2	6	A	1
<i>H. spilopterus</i> (Handl.)	2	6	A	1
<i>Microbembex hirsuta</i> Parker	2,3	7	C	2
<i>Oxybelus abdominalis</i> Baker	3	7	C	1
<i>O. sp.</i>	3	7	C	1
<i>Philanthus albopilosus</i> Cr.	3	7	A,C	2
<i>P. anna</i> Dunn	3	7	C	9
<i>P. polius psyche</i> Dunn	3	7	C	7
<i>Sceliphron caementarium</i> (Dru.)	3	7	A	1

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
<i>Sphecius grandis</i> (Say)	3	6,7	A,C	8
<i>Sphex ferruginosus</i> (Cr.)	3	7	C	2
<i>S. pruinosus</i> (Cr.)	3	7	C	7
<i>S. wrightii</i> (Cr.)	3	7	C	1
<i>S. spp.</i>	3	7,8	C,1	4
<i>Stizus uncinatus</i> Say	3	7	A	1
<i>Tachytes elongatus</i> Cr.	3	6,7	A	2
<i>T. fulviventris</i> Cr.	3	7	A	1
<i>T. obscurus</i> Cr.	3	7	C	1
MUTILLIDAE				
<i>Dasytmilla gordon</i> (Bl.)	3	6,7	3	2
<i>D. klugii</i> (Gray)	3,15,19	6,7	A,C,2	7
<i>Micromutilla bicolor</i> (Bl.) ? ..	3	8	1	1
<i>Photopsis halcyone</i> (Fox)	17	8	2	4
<i>P. sp.</i>	3	8	1	1
SCOLIIDAE				
<i>Campsomeris octomaculata</i> race				
<i>texensis</i> (Sauss.)	3	7	C	4
<i>Scolia lecontei</i> (Cr.)	3	7	C	16
TIPHIIDAE				
<i>Brachycistis dentata</i> Brad.	2	6	1	8
<i>B. indiscreta</i> Fox	3,9	7,8	1	2
<i>B. normalis</i> Mall.	2,3	6,8	1	4
<i>B. sp.</i>	2	6	1	1
<i>Glyptacros angustior</i> Mick & Krom.	3	8		22
<i>Myzine dubiosa</i> Cr.	3	7,8	C	4
<i>Paratiphia</i> spp.	3	7	C,E	23
EUMENIDAE				
<i>Eumenes bollii</i> Cresson	3	6	A	1
POMPIDAE				
<i>Cryptocheilus cressoni</i> Bks.	19	6		1
<i>C. terminatus</i> (Say)	2	7		1
<i>Pepsis bequaerti</i> Salman	3	6	A	3
<i>P. formosa</i> Say	3	6,7	A,D	8
<i>P. nephele</i> Lucas	3	7,8	A	2
<i>P. obliquirugosa</i> Lucas	3	6	C	1
<i>Pompilus fabricii</i> (Bks.)	2,3	6,7	C	5
<i>P. relativus</i> Cr.	2,3	6	A	3
<i>P. spp.</i>	3	6	C	2
VESPIDAE				
<i>Polistes fuscatus</i> var. <i>flavus</i> Cr.	3	6	A	1
<i>Stenodynerus taos</i> (Cr.)	3	7	C	7
<i>S. toltecus</i> (Sauss.)	3	7	C	1
HALTICIDAE				
<i>Agapostemon cockerelli</i> Cwfd.	2	6	A	1
<i>A. melliventris</i> Cr.	3	6,7	A,C,D	15
<i>A. texanus</i> Cr.	2,4	6	A,K	3
<i>Halictus ligatus</i> Say	3	8	C	1
<i>Lasioglossum</i> spp.	2,10,14	6	E,J	3
<i>Sphecodes</i> sp.	2	7		1
MEGACHILIDAE				
<i>Ashmeadiella bigeloviae</i> (Ckll.)	3	7	C	2

TABLE 1.—(continued)

Species	Localities	Months	Habitats	Number
APIDAE				
<i>Anthophora californica</i> Cr.	3	7	I	1
<i>Diadastis rinconis</i> Ckll.	3	7		1
<i>Martinapis luteicornis</i> (Ckll.)	3	7	I	17
<i>Melissodes comanche</i> Cr.	1	7		1
<i>M. spp.</i>	3	7	I	6
Diptera				
ITONIDAE				
<i>Lasioptera</i> sp.	2	6	12	1
APIOCERATIDAE				
<i>Apiocera bilineata</i> Painter	3	7		4
BOMBYLIIDAE				
<i>Anthrax</i> sp.	2	6	A	1
<i>Exeprosopa eremita</i> O.S.	3	7		1
<i>Geron</i> sp.	3,10	6	E,G	8
<i>Phthiria</i> sp.	3	7	C	1
ASILIDAE				
<i>Dizonias tristis</i> (Walk.)	3	7	C	1
<i>Erax bicolor</i> Bell	3	6		2
<i>E. pilosus</i> Hine ?	3,4,10	7,8	1	8
<i>Proctacanthella leucopogon</i> (Will)	10,21	7	2	2
<i>Proctacanthus occidentalis</i> Hine	3,9	7		5
<i>P. sp.</i>	14	6		1
<i>Promachus giganteus</i> Hine	14	6		3
<i>Stenopogon longulus</i> Loew	3	7		1
DOLICHOPODIDAE				
<i>Asyndetus</i> sp.	10	7	E	1
<i>Diaphorus</i> sp.	10	7	E	1
<i>Hydrophorus cerutius</i> Lw.	10	8	I	2
<i>Medeters californiensis</i> Wheeler	1,3	6,7	E,G	2
<i>Parasyntormon occidentale</i> (Ald.)	10	7	E	2
SYRPHIDAE				
<i>Mesogramma marginata</i> (Say)	3	7	C,H	20
OTITIDAE				
<i>Euxesta abana</i> (Curran)	3	6	G	1
<i>E. knowltoni</i> Curran	3	7	E	2
<i>E. scutellaris</i> Curran	2,3	6,7	A	4
<i>E. xeres</i> Curran	4	6	G	3
<i>Melieria occidentalis</i> Coq.	3	6,7	E	13
TRYPETIDAE				
<i>Trypanea bisetosa</i> (Coq.)	4	6	B	1
SAPROMYZIDAE				
<i>Homoneura harti</i> (Mall.)	2,4	6	B	94
<i>H. sp.</i>	2	6	B	1
<i>Lauxania</i> sp.	4	6	A	1
<i>Pseudocalliope</i> n. sp.	4	6	B	1
CHAMAEMYIIDAE				
<i>Leucopis</i> spp.	4,16	6,8	A,B,2	3
HELOMYZIDAE				
<i>Pseudoleria pectinata</i> (Lw.)	3	7	2	1

TABLE I.—(continued)

Species	Localities	Months	Habitats	Number
EPHYDRIDAE				
<i>Notiphila olivacea</i> Cr.	10	7	E	18
CHLOROPIDAE				
<i>Diptotoxa pulcripes</i> Lw.	1	7	E,F	4
<i>Hippelates pusio</i> Lw.	4	6	A	1
ANTHOMYIIDAE				
<i>Coenosia ovata</i> Stein	1,10	7	E	4
<i>Fannia scalaris</i> (F.)	4	6	B	1
<i>F. sp. (conspicua</i> Mall. ?)	4	6	B	2
<i>Hylemya ciliatura</i> (Rond.)	3,10,18,20, 21,22	6,7	2	36
<i>Lispe nasoni</i> Stein	3,10	6,8	1,2	7
<i>L. tentaculata</i> (Deg.)	10	6	2	1
<i>Pegomya</i> sp.	3	7	2	4
<i>Schoenomyza litorella</i> (Fall.)	1,10	7,8	E,1	13
CALLIPHORIDAE				
<i>Calliphora coloradensis</i> Hough	21	7	2	1
SARCOPHAGIDAE				
<i>Eumacronychia decens</i> Tns.	3	7	C	
<i>E. montana</i> Allen	10	6	2	1
<i>E. sp. probably new</i>	18	7	2	1
<i>E. sp. probably new</i>	21	7	2	1
<i>Hilarella hilarella</i> (Zett.)	10	6	2	1
<i>Sarcophaga eleodis</i> Aldr.	3,10,22	6,7	2	21
<i>S. kellyi</i> Aldr.	3,10,18	6,7	2	7
<i>S. lherminieri</i> R.D.	3,10,14,16, 18,20,22	6,7,8	2	29
<i>S. reinhardii</i> Hall	3,10,18	7	2	7
<i>S. robusta</i> Aldr.	4,10,16,18, 20,21,22	6,7,8	A,2	23
<i>S. sarracenioides</i> Aldr.	18	7	2	1
<i>S. sulcata</i> Aldr.	10,18	6,7	2	12
<i>S. sp. nr. masculina</i> Aldr.	2,3,4	6,7	A,B,C	9
<i>S. spp.</i>	3,18,20	7	A,C,2	12
<i>Senotainia flavicornis</i> (Tns.)	3	7	A	1
<i>S. trilineata</i> (VDW)	3	7	A	1
TACHINIDAE				
<i>Cloacina filialis</i> Reinhard	3	6	A	1
<i>Distichona varia</i> VDW	3	7	A	1
<i>Doryphorophaga doryphorae</i> (Riley)	3	7		1
<i>Drepanoglossa lucens</i> Tns.	3	7	C,D	4
<i>Euphorocera tachinoides</i> Tns.	3	7		1
<i>Goniochaeta plagioides</i> Tns.	10	6	2	2
<i>Hyalomyopsis aldrichi</i> ? Tns.	3	7	C	1
<i>Nephrocera claripennis</i> (Macq.)	10	6	2	1
<i>Oestrophasia signifera</i> ? VDW	2	6	A	1
<i>Phorocera</i> sp. (of Aldr.)	3	7	A	1
<i>Schizotachina convecta</i> (Walk.)	2	6	B	1
<i>S. vitinervis</i> Thompson	2	6	B	4
<i>Viviania</i> sp.	3	7,8	A,1	2

DISCUSSION

A total of 451 species and subspecies of insects are reported in Table 1. Of these, 371 were collected at localities within or at the edge of the dunes area of the White Sands. At locations outside this area 79 species and subspecies were collected which were not found within the White Sands dune area. A total of 64 species are recorded both within and outside the White Sands.

Most of the material from the White Sands was taken at Ridingers at the edge of the dunes, where 263 species and subspecies were collected. Totals of 92 and 47 forms were taken at the Picnic Area and Loop Drive, localities five and seven miles within the dunes area respectively. The number of species diminishes from the outer part of the dunes area inward. Greater amounts of time were spent collecting in the more densely populated areas and therefore the numbers of species collected at the several localities cannot be relied upon for a quantitative measure of the "thinning out" effect of the increasingly severe ecological conditions. A principal component of this effect must be the decline in the flora toward the interior.

Comparison with areas outside the dunes is uncertain due to the lack of adequate collecting in these areas, but it can be stated that the frontal or peripheral dunes furnish a suitable habitat for more species of insects than do level areas of the valley floor outside the dunes area. This is correlated with the presence on and between the frontal dunes of a number of species of plants not found on the flat valley floor.

The most notable of these plants, from the standpoint of the variety of insects associated with it, is the *Yucca*. On this plant 67 species of insects were collected. Of these, *Aphis helianthi*, *Enoclerus abdominalis* var. *spinolae*, *Tragidion armatum*, *Sarcophaga robusta*, and *Tegeticula alba* are species occurring on *Yucca* in sufficient numbers so that specific ecological relationship to this plant seems certain. Other species collected in smaller numbers may also have such relationships.

On *Tamarix* 53 insect species were collected, including a number of the species found on *Yucca*. On various species of grasses 44 species of insects were taken. A total of 43 insect species were collected on *Atriplex*. Fourteen species were collected on *Chrysothamnus* and the same number were taken on the few specimens of *Populus* found in the dunes area.

Large aggregations of the flea-beetle *Haltica foliacea* were observed feeding on the evening primrose *Anogra*. A large series of Coleophorid larvae was collected from *Atriplex*. A number of these larvae were reared to the imago stage and several species of their parasites were obtained, including two species of Chalcids and a Tetrastichid.

An examination of the collection records shows a rather regular increase in the number of species collected as the season progressed.

Seven of the species collected are known to be new.

The absence of adaptation to the soil color is more striking than its presence. The insect species which show definite white coloration adaptation include two camel-cricket, one grasshopper, and possibly a tiger-beetle and an ant. It seems likely that *Ammobaenites phrixocnemoides arenicolus* and *Daihinoides hastiferum larvale* have genetic differences from the related brown subspecies. A more extensive discussion of these cases will be given elsewhere (Stroud and Strohecker, 1949). *Cibolacris parviceps arida* is said to be able to change its color from one instar to the next in accordance with the color of the substrate. Reddish brown specimens were taken on red soil near La Luz, but those from the White Sands dunes area were very light in color. Some of the other White Sands Orthoptera may be somewhat lighter than material from surrounding areas.

Some of the *Cicindela praetextata* collected were very near the typical form but others have very broad white margins covering more than half the elytra. E. G. Smyth suggests that since intermediates were collected, the whiter members should not be given varietal designation. *Cicindela lepida* is found in many areas of light-colored sand within its range and was taken on dunes in the White Sands in great abundance, always at night. They ran rapidly over the sand but were not observed to fly. The positive phototaxis reported by Bugbee (1942) was not observed. The markings of this species were like those of specimens from other areas.

R. E. Gregg points out that whereas light subspecies of ants are among those collected, none of these is confined to the White Sands area. He states that the specimens of *Lasius niger neoniger* are very light but that light-colored specimens are known from other dunes areas.

Cases of light coloration adaptation among spiders, scorpions, and solpugids of the White Sands area will be discussed in a subsequent paper.

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A Revised Nomenclature for the Chaetotaxy of the Mosquito Larva

(Diptera: Culicidae)

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The recent recognition of species complexes within populations formerly believed to represent a single species has focused the attention of students of mosquitoes to a reexamination of characters previously used in the separation of species and to a search for new morphological features useful in diagnosis. The immature stages of mosquitoes offer a greater variety of morphological characters which can be studied quantitatively, analyzed, and used for recognition of species than do the adults. Until recently almost all the attention was paid to the head, a few thoracic and abdominal hairs and the terminal abdominal segments of the larva, and the trumpets, paddles and a few abdominal hairs of the pupa. The larval characters used have not been entirely satisfactory and in the last few years the pupal stage has attracted more attention in the search for additional diagnostic characters. This interest in the pupa has culminated in the work of Knight and Chamberlain (1948) who made a comparative study, devised a new nomenclature, and illustrated the complete chaetotaxy of representatives of practically all the genera. The study of the larva has not progressed as rapidly, perhaps because of the greater complexity of the chaetotaxy, since the larva has upward of 200 pairs of hairs while the pupa appears to have about 105 pairs. The complete larval chaetotaxy for the majority of the genera is still unknown. In the course of a study on the genus *Uranotaenia* from the Solomon Islands, the complete larval chaetotaxy of seven species was described and figured by the author. In the preparation of descriptions it became evident that the existing nomenclatures were not entirely satisfactory as various combinations of numerical, alphabetical and nominal terminologies have been used by different workers according to their individual preferences and no system used all the elements of the larval chaetotaxy known at the present time. It seemed advisable, therefore, to prepare a uniform nomenclature which would (1) take into account all the established elements of the chaetotaxy of the fourth instar mosquito larva, (2) allow for the later inclusion of certain elements now poorly known, (3) show homologies where they have been established, (4) be equally suitable for anophelines and culicines, and (5) be easy to use in descriptions.

The chaetotaxy of mosquito larvae has been thoroughly studied by a large number of workers, notably Martini, Christophers, Puri, Root, Edwards, Barraud, Baisas, and Hurlbut. With the exception of the mouthparts it is believed that all the hairs have been described. The system of nomenclature devised originally by Martini and greatly modified and improved by various

workers is based on the homology of hairs of anopheline and culicine larvae with those of the subfamily Dixinae. Since it shows so clearly the common pattern of chaetotaxy in the entire family and provides us with means of determining relationships and evolutionary lines, this system seems to be ideal and it would appear foolhardy and unwise to discard it. Therefore, it is retained almost entirely in the revised nomenclature proposed here and is modified extensively only on the head by renumbering certain hairs to allow for an orderly numbering of appendicular hairs in separate sequences, and on the terminal abdominal segments where a completely artificial nomenclature is introduced. The other changes suggested are minor ones on the thorax and abdominal segments. It may be argued that a revised nomenclature should not be attempted until a comparative study of all the genera has been made. Such a study, undoubtedly, would be desirable. On the other hand the general pattern of chaetotaxy is already known so that it is unlikely that any new elements will be added to the basic pattern for which no provision has been made in this system. Furthermore it is impossible for one individual to study an adequate number of forms since it appears that, at least in some genera, there are several different plans of chaetotaxy and all these would have to be taken into account. It is the intent of the author to review the chaetotaxy of mosquito larvae, to discuss the criteria of homologies, and to provide in one paper a basis for other workers in the field so that eventually such a comparative study may be accomplished cooperatively.

BASIC PATTERN OF CHAETOTAXY

The basic plan of chaetotaxy of a mosquito larva consists of 15 pairs of hairs per segment arranged in an orderly linear bilateral manner from mid-dorsal to midventral lines. This complete number of hairs is retained in at least a few abdominal segments of apparently the majority of species of mosquitoes. Two pairs are usually poorly developed and one or both may be entirely absent. They were originally overlooked in the nomenclature. If one considers only the 13 pairs of hairs normally well developed, then all mosquitoes have them on abdominal segments II through VII, without any exceptions known to me. In all mosquitoes, certain of these abdominal hairs always have a characteristic position corresponding from species to species in anophelines and culicines and furthermore show a corresponding degree of development as far as length and branching are concerned. The first abdominal segment usually lacks one or more additional pairs of hairs. The terminal abdominal segments are greatly modified, differently in the anophelines from other mosquitoes, but even here there is a complete correspondence in all the forms.

On the thorax there are three groups of hairs corresponding to the three segments forming this tagma. The primitive number of 15 pairs of hairs is retained on the prothorax of at least some anophelines and sabethines. The mesothoracic group has 14 pairs of hairs in all mosquitoes and the metathoracic 13. As on the abdomen, certain hairs or groups of hairs show a similar position, degree of development, and association in species of widely divergent lines.

As the head consists of a number of segments completely fused together and is a highly specialized tagma its chaetotaxy is greatly modified. The head capsule appears to have 16 pairs of hairs primitively. One or two pairs of these are frequently absent but the remainder occur in definite positions in all mosquitoes. Of the head appendages, only the antenna has been adequately studied and it too has a uniform pattern of chaetotaxy, bearing 6 hairs in the same relative position in all species of mosquitoes.

It seems obvious, therefore, that the chaetotaxy of mosquito larvae is generally homologous (from species to species) in all forms and that furthermore it is serially homologous in each species except for the head and its appendages and the anal segment. That general and serial homologies extend to individual hairs seems unquestionable also, since at least certain corresponding hairs are developed in a similar manner and furthermore it seems likely that such uniformity in the general pattern could arise in the entire group only if homologous units were involved.

CRITERIA FOR HOMOLOGY

When it comes to actually determining the general homology of individual hairs in different forms, the greatest difficulties have arisen in the more generalized tagma of the body, the abdomen. The chaetotaxy of the head, and perhaps its appendages, is so set that no difficulties are usually encountered in general homologies. The criterion used is that of position of the hair—not its absolute position but its relative position to certain constant morphological features of the exoskeleton and its relation to other hairs. The degree of development, length, and branching are of no particular value, neither is the absolute position since it is affected by differential development of the head capsule. Individual variation in position is not great on the head of the larva. The same criterion is applied to the anal segment where the chaetotaxy is greatly reduced and very uniform.

Homologies on the thorax are relatively easy to determine. Although no sclerites are present and other morphological features are lacking, hairs 9 to 12 uniformly occur as a group which serves as a land mark for general homologies as well as serial homologies. Except for hair 0 on the prothorax, hair 14 (old terminology) on the prothorax and mesothorax, and hairs 3 and 4 of the metathorax of anophelines, all the hairs retain their relative position to each other in regular numerical sequence but may show shifts in cephalic or caudal direction. Individual variation in position is slight. A great deal of variation in the development of the various hairs occurs in different groups and between the three segments within a particular group of species. Several homologies within the thorax are dependent almost entirely on position of a hair in relation to another hair of definite position and of characteristic development, branching or basal tubercle. It is probable that, as interpreted in the past, the thoracic chaetotaxy is serially homologous with that of abdominal segments with the possible exception of the prothoracic hair 0 in all forms and median dorsal hairs of the anopheline metathorax. To determine this more definitely would require the examination of a large number of species from

many different groups. Furthermore it cannot be done satisfactorily until a better understanding of abdominal chaetotaxy is at hand.

The chaetotaxy of the proximal abdominal segments has been studied to a limited degree in anophelines but has been almost entirely neglected in other mosquitoes. Most investigators, even in the case of anophelines, have been determining homologies largely on the basis of direct comparison of individual species, segment for segment, with previously published figures and basing their homologies primarily on the degree of development of the hairs rather than their relative position. This has led to a multitude of different interpretations. It would appear from an examination of these interpretations that every hair changes position but that it generally tends to retain its characteristic branching and degree of development. To follow such a procedure is to disregard completely the criteria which have been found workable on the head and thorax, which have been investigated much more thoroughly. It is undoubtedly true that the chaetotaxy of abdominal segments is much more plastic than that of the head and thorax. Nevertheless it would appear that the same criteria should be used with the same relative weight as on the other regions of the body. It is also evident that the degree of development of a hair is a specific character while changes in position are supraspecific in nature.

In determining homologies in forms which exhibit serial as well as general homologies, it is essential that a basic segment be chosen as a starting point. Such a segment should show as closely as possible the primitive condition and be least modified in all the forms considered. It is well known that different segments of a segmented animal may specialize in different ways even in closely related forms and, therefore, direct comparison, segment for segment, is dangerous. Such a basic primitive segment for the chaetotaxy of mosquito larvae is unquestionably the second abdominal segment. It shows, in all the forms examined, a remarkable constancy in position of hairs and a full complement of hairs which can be easily homologized from species to species. Almost invariably all the hairs are present in a regular linear numerical sequence from middorsal to midventral line and any departure from this can be easily determined. Thus general homologies are usually very simply made. In cases where the hairs are arranged in two rows on the dorsal and ventral surfaces or there has been a shift in position, the criteria outlined below for serial homologies are used. After the homologies are established for the basic second abdominal segment, serial homologies are determined for all the other segments. There is a considerable amount of shifting of hairs in different ways on different segments in various groups of species. It appears evident nevertheless that certain hairs always retain the same position, and that the extensive shifting is apparently largely confined to hairs 2 and 3 on the dorsal surface and to hairs 11 and 12 on the ventral surface. For homologies on the abdomen, the same criteria are used as for the cephalic and thoracic areas and in the same order of importance. It should be stressed again that it is the relative and not always the absolute position of a hair that is important. Most hairs, with the exceptions noted, tend to retain a definite relationship to each other. This is particularly important to remember when dealing with

segments in which part or all of the hairs have been moved from their normal position through differential growth. In such cases, it appears that hairs now occurring in a new area have a tendency to develop in a different manner resembling hairs normally present in that area. This may seem to completely contradict the entire system. It is quite evident, nevertheless, from the relative position of other hairs that this actually occurs, for this reason little weight is placed on the length and branching of hairs which do not occur normally in a definite position on the segment.

The eighth abdominal segment and the spiracular lobe or siphon present a special problem which is discussed below. For reasons outlined there, it appears best to drop homologies with the proximal abdominal segments and adopt for the eighth segment proper, the spiracular lobe or siphon, as well as the anal segment, completely independent numerical terminologies which do not imply homologies with the rest of the abdomen.

The pupal chaetotaxy appears to bear a direct relationship to that of the larva, at least on the generalized abdominal segments. It may seem far-fetched to homologize them but striking similarities are evident: (1) the position of hair 13 of the pupa corresponds to hair 14 of the larva, (2) hair 1 of pupa occupies the same position as hair 0 of the larva, (3) hair 2 of the pupa occupies the same position as hair 1 of the larva, (4) hair 5 corresponds in both stages as does hair 8, (5) on the ventral surface hairs 9 and 10 exhibit the same relationship as they do in the larva. Furthermore corresponding hairs show shifts in position, for example pupal 3 and 4 equivalent to larval 2 and 3, and larval and pupal 11 and 12. Abdominal larval hair 13, which is usually well developed and stellate, is absent in the pupa, in line with the general reduction of the ventral hairs in this stage. It appears also that the arrangement of hairs on the dorsum of the second abdominal segment is more uniform and more easily homologized from species to species than on any other segment, in the pupa as well as in the larva. For these reasons, it might be advisable to re-examine the pupal nomenclature in the future and homologize it with the larval chaetotaxy.

GENERAL CONSIDERATIONS

The general plan of this revised nomenclature is the same as in the original Martini system, i.e. the designation of hairs by arabic numerals in sequence from middorsal to midventral line, and in cephalo-caudal sequence if more than one row of hairs is present. In several cases, in order to minimize confusion, hair 0 has been utilized to designate certain hairs which were originally overlooked and actually probably belong at the head of the sequence, but not always. The plan used for appendages is a numerical sequence starting at the proximal end and running to the apex, and on the latter extending from mesal to ectal surfaces. The same plan is utilized for the spiracular lobe or siphon and the anal segment, except that at the apex of these structures, the sequence is from dorsal to ventral externally, and mesal to ectal internally on the valves. Where a duplication of hairs occurs, as on the thorax of *Toxorhynchites* (= *Megarhinus*), or when a single number is given to a hair group, the indi-

vidual elements are designated as 1a, 1b, 1c—etc. . . . as indicated in the discussions below.

One hundred and ninety-three pairs or groups of hairs are numbered in the present system. This number does not include the mouthparts, which have not been adequately studied, nor the dorsal, lateral, and ventral hairs of the sabethine siphon which are of restricted occurrence. The complete larval chaetotaxy of *Uranotaenia atra* Theo. is illustrated as no member of this genus has been previously figured. Figures of the head and terminal abdominal segments of *Anopheles walkeri* Theo. are labeled to indicate the principal changes in nomenclature proposed here.

In order to establish homologies for *Uranotaenia* it was necessary to study representatives of the majority of genera. Observations on these indicate that there is a multitude of specific and supraspecific characters in the abdominal as well as the thoracic chaetotaxy of culicine and sabethine larvae. The larval hairs are subject in most cases to less individual variation, particularly in position and to a lesser extent in branching, than those of the pupa. Since there appear to be several different chaetotaxy patterns in the larger genera, a great deal of work needs to be done before the various homologies are definitely established. It is hoped that more attention will be paid in the future to the abdominal and thoracic chaetotaxy of culicine and sabethine larvae. The study of species with well developed stellate hairs is particularly illuminating since the hairs are easily recognized by their characteristic development, and their migration or constant position can be readily determined. Such species occur in the majority of genera and particular emphasis should be placed on them.

In determining the homologies of lateral abdominal hairs it is necessary to examine unmounted whole larvae in which the relative positions are easily seen. Details of branching and the presence of abdominal hairs 0 and 14 are more easily determined from cast skins. Following this, drawings are best made from mounted whole larvae.

THE HEAD CAPSULE

Twenty-one pairs of head hairs have been given numbers in the modified Martini system. In addition to the hairs of the head capsule, these included two hairs on the antenna and three on the maxilla. Both the antenna and the maxilla have additional hairs which are constant in occurrence and show specific differences. Furthermore, other head appendages may prove, upon investigation, to have a constant chaetotaxy and will have to be recognized. It is proposed, therefore, to treat the head capsule separately from the appendages. This requires a renumbering of the head hairs since the 5 appendicular hairs were mixed in the previous terminology. Fortunately the proposed changes affect hairs which have seldom been used in descriptions, although they show good characters in some forms and should be studied more. It is believed that the renumbering, as here proposed, will facilitate descriptions since the hairs are located in a regular numerical sequence which is easy to follow.

TABLE 1.—Chaetotaxy of the head.

Proposed System	Descriptive Terminology	Present Terminology	
		Numerical	Alphabetical
<i>Head Capsule</i>			
0*	Outer preclypeal	1a*	
1	Inner preclypeal, clypeal or labral spine	1	
2	Inner clypeal, inner anterior clypeal	2	
3	Outer clypeal, outer anterior clypeal	3	
4	Post clypeal, posterior clypeal, preantennal	4	d*
5	Inner frontal, inner postantennal, upper head hair	5	C*
6	Midfrontal, midpostantennal, lower head hair	6	B*
7	Outer frontal, outer postantennal, preantennal	7	A*
8	Sutural, inner occipital, vertical	8	e*
9	Transsutural, outer occipital	9	f*
10*	Supraorbital, orbital, dorsal eye hair	14*	
11*	Basal, subantennal	12*	
12*	Infraorbital, ventral eye hair	15*	
13	Subbasal, postmandibular	13	
14*	Post maxillary	18*	
15*	Submental	20*	
<i>Antenna</i>			
1*	Antennal, shaft hair	11*	
2*	Inner subapical, dorsal sabre		
3*	Outer subapical, ventral sabre		
4*	Terminal antennal	10*	
5*	Hyaline process, papilla		
6*	Finger process		

* Indicates a proposed change in nomenclature.

A maximum of 16 pairs of hairs occurs on the head capsule proper as follows: (* indicates a change in nomenclature)

- *0. The outer preclypeal or outer labral hair was not recognized in the original system. It is usually a minute hair situated laterad of hair 1, either at the lateral extremity of the labral flap (preclypeus) or on its underside. It is generally flattened and translucent but may be elongate. In *Uranotaenia* it is well developed and shows good specific differences.
1. The inner preclypeal hair or clypeal spine is the most anterior and median hair on the labral flap (preclypeus). It is well developed in most species and shows good specific characters in many culicines. In predaceous species with the labrum reduced in the center and the anterolateral angles of the head capsule produced forward, it is caudad of hairs 0 and 3, and possibly 2.
2. The inner clypeal hair is well developed in anophelines and has been much used in descriptions. In the culicines it is usually absent but may be represented by a minute peg in a setal ring in certain *Aedes* or by a minute spine in some species of the subgenus *Culicomyia*. No trace of it could be found in *Uranotaenia*. This hair is the median of the two pairs of hairs situated at the anterior border of the clypeus on the portion of this sclerite elevated above the labrum.
3. The outer clypeal hair is well developed in anophelines and shows excellent characters. In the culicines it is small but distinct, situated near the lateral anterior border of the clypeus. In sabethines and certain species of *Aedes*,

which have the head capsule rounded in front, what appears to be this hair is carried on the underside of the head capsule, above the base of the mouthparts where it joins hair 0. It is possible that the two hairs present in this position are 2 and 3, but since hair 0 is of more general occurrence than 2 in culicines and no trace of hair 0 could be found anywhere else on the "pre-clypeus" of these species, it appears that the first interpretation is correct.

4. The postclypeal hair is sometimes well developed in culicines and sabethines but is usually small in most mosquitoes. It is generally the most anterior and median of the "fronto-clypeal" hairs.
- 5 to 7. The inner (upper), median (lower), and outer (preantennal) frontal head hairs respectively are the three conspicuous dorsal head hairs, located in variable position on the "fronto-clypeus." They retain the above sequence in most cases.
8. The sutural head hair is located posteriorly (usually) near the lateral border of the "fronto-clypeus."
9. The transsutural hair is located laterad of the "fronto-clypeal" suture at the level of hair 8.
- *10. The orbital hair is located laterally above the larval eye.
- *11. The subantennal hair is located ventro-laterad near the base of the antenna.
- *12. The infraorbital hair has a characteristic position laterally below the eye. It may migrate mesad but is always laterad of hair 13.
13. The subbasal or postmandibular hair is located mesad and usually caudad of hair 11 in anophelines. Depending on the shape of the head capsule it changes its position considerably in culicines, usually becoming associated with hair 12.
- *14. The postmaxillary hair is ventral in position at the base of the maxilla. It shifts its position considerably in different forms and should not be confused with the basal maxillary hair with which it may be associated. The latter is located on a small triangular basal sclerite of the maxilla which may appear to belong to the head capsule but is actually separated from it by a suture.
- *15. The submental hair is usually the most mesal of the ventral head hairs. It is located on the "submentum" when the latter is indicated by the "gular" sutures. When the latter are absent it is distinctly the most mesal of the ventral hairs.

THE ANTENNA

The six hairs which regularly occur on each antenna show excellent characters for the separation of species. Two of these hairs were formerly numbered along with the hairs of the head capsule, while the others were not considered in any numerical or alphabetical system. These hairs show considerable variation in position in different species but are easily homologized both in anophelines and culicines on the basis of the characters given below. They are numbered in a separate numerical sequence starting at the proximal end of the antenna as follows:

- *1. The antennal shaft hair is variable in position and development but is nearly always proximal to the remaining hairs and easily identified.
- *2. The inner subapical hair of the culicines arises subapically on the internal ventral surface but may be carried dorsad on the internal surface. The corresponding hair in anophelines is the dorsal sabre located near the internal angle of the ventral surface.

- *3. The outer subapical hair of the culicines arises subapically on the external ventral surface but may accompany hair 3 to the internal surface of the antenna where it is then ventral to hair 3. The corresponding hair in anophelines is the ventral saber located near the external angle of the ventral surface.
- *4. The terminal antennal hair is dorsal and terminal and usually median in position in culicines. In anophelines it appears to arise externally but actually has the same relative position because of the rotation of the antenna on its axis which brings the ventral surface mesad and slightly dorsad.
- *5. The hyaline process arises in the center of the apex in a small depression or slightly before the apex in some culicines. It is easily recognized in both anophelines and culicines by its translucent outer portion.
- *6. The finger process is terminal, dorsal and external. It is easily recognized by its blunt apex and the presence of a transverse transparent portion near its base.

THE MOUTHPARTS

The mouthparts of mosquito larvae have not been adequately studied as yet and homologies are not clear. Therefore their chaetotaxy is not taken into account at this time but it can be easily added in the future using the same system of nomenclature as for the antenna above. The maxillary palpus, in particular, shows a great number of specific differences in some groups. It is interesting to note that the palpus of dixines, and to a lesser extent of the anophelines, shows striking similarity in chaetotaxy to the antenna in these forms. There is a need for homologizing the hairs of the culicine palpus with those of the anophelines and dixines as there is a reduction in the number of hairs in the former. The basal maxillary hair is present in all groups but the culicines appear to lack the palpal hair and the terminal hairs are reduced from 7 to 4 in number. The body of the maxilla appears to have more than the single hair described and numbered to date. The mandible has several hairs which may be of general occurrence. Finally, the labial complex has not been studied and may reveal elements of chaetotaxy which should be included in a complete nomenclature.

THE THORAX

The thoracic chaetotaxy of anophelines has been extensively studied by Puri and has been adapted by Barraud and others for culicines. Certain discrepancies in their individual interpretations of the thoracic chaetotaxy and differences in both interpretations from the chaetotaxy of the abdomen are evident. It is believed that the changes proposed here to correct these reflect more the true condition. The renumbering of these hairs does not necessitate the renumbering of the entire series.

THE PROTHORAX

The prothorax has a full complement of 15 pairs of hairs, numbered 0 to 14. In general these follow a regular sequence starting at the middorsal line. There is a considerable variation from group to group in the relative length, branching, and development of basal tubercles in these hairs, but they appear to retain their relative position in all groups with the exceptions noted below.

0. Hair 0 in culicines is placed caudad of 4; in anophelines when present it is mesad and caudad of 1. It appears improbable that it is homologous with hair 0 of the abdomen, since in the latter it is always cephalad of 1. No change is proposed at the present time since the homology is not clear to me.
- 1, 2 & 3. These hairs, the *submedian prothoracic* group, are closely associated and often occur on a common tubercle. It is probable that one of these is homologous with hair 0 of the abdomen.
- 4 to 7. These hairs are dorsal in position, in regular sequence and variously developed.
8. Hair 8 is lateral or ventrolateral in position.
- 9 to 12. The *prothoracic pleural* group is the conspicuous landmark on the ventral or ventrolateral surface. The hairs occur in two series on a common tubercle. Hair 9 is the external anterior hair, 10 the internal anterior, 11 the external posterior, and 12 the internal posterior. Hair 10 has a tendency to be longer than the others, 9 to be slightly shorter and branched, 11 to be reduced, and 12 to be medium sized.
- *13. It is evident from comparison with a large number of species of sabethines and culicines that the hair formerly known as 14 is more probably homologous with hair 13 of the abdomen. In sabethines both this and the following hair are well developed and their relationships are clear. Hair 13 is associated on all thoracic segments with the pleural group. On the prothorax it is placed cephalad of this group and sometimes slightly laterad. It is absent in all culicines examined, the hair formerly known as 13 in these forms is actually hair 14.
- *14. This hair has been called 13 in the past. It is the hair closest to the mid-ventral line of segment. As indicated above both 13 and 14 are well developed in sabethines and it appears more probable that 14 would retain its usual position near the median line.

TABLE 2.—Chaetotaxy of the thorax.

Proposed System	Descriptive Terminology or Position	Present numerical system	
		Anophelines	Others
<i>Prothorax</i>			
0	Accessory dorsal	0	0
1 to 3	Submedian group, shoulder hairs	1 to 3	1 to 3
4 to 7	Dorsal	4 to 7	4 to 7
8	Dorsolateral	8	8
9 to 12	Prothoracic pleural group	9 to 12	9 to 12
*13	Ventrolateral	*14	not recognized
*14	Median ventral	*13	*13
<i>Mesothorax</i>			
1 to 7	Dorsal	1 to 7	1 to 7
8	Dorsolateral	8	8
9 to 12	Mesothoracic pleural group	9 to 12	9 to 12
*13	Ventrolateral	*14	*14
*14	Median ventral	*13	*13
<i>Metathorax</i>			
*1	Dorsal	*3	1
*2	Dorsal	*4	2
*3	Dorsal (palmate in anophelines)	*1	3
*4	Dorsal	*2	4
5 to 7	Dorsal	5 to 7	5 to 7
8	Dorsolateral	8	8
9 to 12	Metathoracic pleural group	9 to 12	9 to 12
13	Median ventral	13	13

* Indicates a proposed change in nomenclature.

MESOTHORAX

The mesothorax carries a maximum of 14 pairs of hairs numbered 1 to 14, hair 0 being apparently absent. All 14 pairs of hairs are usually present. They normally follow a regular numerical sequence as on the prothorax but corresponding hairs on the two segments show entirely different development. In anophelines hairs 1 and 2 are usually placed considerably caudad of the others on the dorsal surface. The same changes in hairs 13 and 14 are proposed here as they are just as clearly shown on this segment in sabethines and in some culicines.

1. This hair has a tendency to be stellate or branched in culicines and is characteristically developed in anophelines.
- 2 to 7. These are dorsal in position and variously developed.
8. Hair 8 is lateral or ventrolateral in position.
- 9 to 12. The mesothorax pleural group, with the same arrangement of individual hairs as on the prothorax, is ventrolateral in position, mesad of 8.
- *13. This hair is cephalad and sometimes laterad of 9 to 12. It was formerly known as 14.
- *14. This is the most mesal hair and is characteristically developed.

METATHORAX

The metathorax has a complement of 13 pairs of hairs, 0 and 14 not having been recognized. It appears to me that in both anophelines and culicines the primitive sequence of the hairs is retained and the numbering used by Puri is incorrect for the following reasons. In culicines both hairs 1 and 3 are frequently stellate, a condition comparable to a palmate hair in anophelines, and hair 3 is often better developed than 1. In first instar anopheline larvae, hairs 1 and 3 are both developed as lanceolate hairs similar to hair 1, the future palmate of the abdominal segments. The palmate or branched hair of the metathorax of the fourth instar anopheline larva has been interpreted as hair 1 principally because of its resemblance to the palmates of the abdomen and to the characteristic branched hair of the mesothorax. This hair can be interpreted on the basis of position as corresponding to hair 3 of culicines, an interpretation consistent with the potentiality of hair 3 to develop into a palmate or stellate hair as shown by the first instar anopheline and also by the characteristic development in culicines. Furthermore, no wholesale migration of hairs occurs anywhere else on the thorax. Therefore the anopheline hairs are renumbered and brought in line with those of the culicines.

- *1. Renumbered in anophelines only—formerly hair 3. This is the most mesal of the metathoracic hairs.
- *2. Renumbered in anophelines only—formerly hair 4. This hair is slightly external and caudal to 1.
- *3. Renumbered in anophelines only—formerly hair 1. This is the palmate hair of the metathorax. It is removed some distance cephalad and lateral of the preceding two hairs in anophelines, culicines, and sabethines.
- *4. This hair is renumbered in anophelines only—formerly hair 2. The position of this hair is somewhat variable but usually it is laterad and caudad of 3.
- 5 to 7. These hairs are dorsal or dorsolateral in position and variously developed.
8. Hair 8 is ventrolateral in position, usually cephalad of 7.

9 to 12. The *metathoracic pleural* group is ventrolateral in position and has the same arrangement of hairs as the prothoracic group.

13. Hair 13 is mesad of 9 to 12 and usually quite close to this group.

THE ABDOMEN

The abdominal chaetotaxy has not been used extensively except for the terminal segments, the subdorsal and lateral hairs in the culicines, and a few additional hairs in anophelines. No real attempt at homologies in culicines has been made to date. From observations made in the course of this study, it appears that, in addition to specific differences, valuable supraspecific characters are to be found in the position of hairs on various abdominal segments but since no special effort was made to study these, no generalizations can be made at this time.

A maximum of 15 pairs of hairs are found on segments II to VII; apparently 12 pairs on segment I, although all 15 are known to occur but not in any one species; 7 pairs on segment VIII (as restricted in this study); 13 pairs on the spiracular lobe or siphon; and 4 pairs or groups on the anal segment.

The basic segment for serial homologies appears to be segment II on which, in all forms examined, all the hairs are present in consecutive numerical sequence or departures from this are simply determined. Homologies on segments I and III to VIII are easily determined by working out the constant relative position of certain diagnostic hairs. Segment VIII, the spiracular lobe or siphon, and the anal segment have a specialized chaetotaxy which is not homologized with the preceding abdominal segments as indicated below.

ABDOMINAL SEGMENTS II TO VII

Each of these segments may carry a full complement of 15 pairs of hairs but generally only 13 pairs are well developed in culicines, 14 pairs in anophelines, and the full 15 pairs in some sabethines.

The second abdominal segment is taken as a basic segment from which serial homologies are determined for the other segments. The usual position and development of hairs on this segment is as follows. Hairs 0 to 5 are dorsal, 6 to 8 lateral, 9 to 14 ventral in position.

0. This hair is usually placed far forward on the segment. It is of general occurrence in anophelines, is present in some sabethines, but apparently is greatly reduced in most culicines. Usually it is poorly developed but may be very conspicuous as in some sabethines.
1. Hair 1 is constant in position, being the most caudal and mesal hair on the dorsal surface of the segment. It is usually well developed and has a tendency to become stellate or palmate.
- 2, 3. These hairs are subject to much change in position but are usually present in the proper sequence on this segment. When they shift their position cephalad or mesad, the more cephalic hair is arbitrarily called hair 2.
4. Hair 4 may change its position but usually does not migrate as much as 2 or 3 and remains close to hair 5.

TABLE 3.—Chaetotaxy of the abdomen.

Proposed System	Description Terminology or Position	Present numerical system	
		Anophelines	Others
<i>Segment I</i>	As in segment II, usually only 12 pairs present, with following hairs present or absent:		
0*	Accessory dorsal	not rec.*	not rec.*
2	Dorsal	2	2
8*	Anterior dorsolateral	not rec.*	not rec.*
9	Posterior ventrolateral	9	9
11	Ventral	11	11
14*	Ventral intersegmental	not rec.*	not rec.*
<i>Segment II</i>	Usually 0 and 14 missing or undeveloped		
0*	Accessory dorsal	0	not rec.*
1 to 5	Dorsal	1 to 5	1 to 5
6 & 7	Upper and lower lateral	6 & 7	6 & 7
8	Anterior dorsolateral	8	8
9	Posterior ventrolateral	9	9
10 to 13	Ventral	10 to 13	10 to 13
14*	Ventral intersegmental	0*	not rec.*
<i>Segments III to VII</i>	As on segment II with the following exceptions:		
7*	Lower lateral	9*	7
9*	Posterior ventrolateral	7*	9
<i>Segment VIII</i>	No homologies with other segments		
0*	Accessory dorsal	0	not rec.*
1*	First pentad	$\alpha, 7, 8^*$	A, α^*
2*	Second pentad	$\beta, 6, 7^*$	β^*
3*	Third pentad	$\gamma, 9^*$	B, γ^*
4*	Fourth pentad	$\delta, 10, 11^*$	δ^*
5*	Fifth pentad	$\epsilon, 13^*$	C, ϵ^*
14*	Ventral intersegmental	0*	not rec.*
<i>Spiracular Lobe or Siphon</i>	No homologies with other segments		
1*	Postspiracular or siphonal tuft	g^*	g^*
2*	Dorsal preapical or basal of pecten	6, h^*	h^*
3*	Inner fossate	3*	3*
4*	Median fossate	2*	2*
5*	Outer fossate	1*	1*
6*	Proximal dorsal valve hair	5*	5*
7*	Distal dorsal valve hair	4*	4*
8*	Proximal ventral valve hair	f^*	f^*
9*	Distal ventral valve hair	e^*	e^*
10*	Inner basal ventral valve hair	a^*	a^*
11*	Inner apical ventral valve hair	b^*	b^*
12*	Inner apical ventral valve hair	c^*	c^*
13*	Median ventral valve hair	d^*	d^*
<i>Anal Segment</i>	No homologies with other segments		
1*	Lateral hair of saddle		
2*	Inner or dorsal of dorsal brush		
3*	Outer or ventral of dorsal brush		
4*	Ventral brush		

* Indicates a proposed change in nomenclature.

5. Hair 5 has a very characteristic position on the posterolateral angle of the segment, dorsal and slightly caudad of hair 6.
6. Hair 6 is the upper pleural hair and is well developed on segments I and II. It may become variously reduced on the following segments but not to the extent of being difficult to identify by its characteristic lateral position.
- *7. Hair 7 is the lower pleural hair situated directly ventrad of hair 6 but sometimes slightly caudad as well. When it becomes reduced, as is frequently the case on segments III to VII, it can be identified by its position in relation to hair 6. It appears to me that it has been incorrectly interpreted in anophelines. From an examination of a large number of species it is evident that it always retains its relationship to hair 6 and does not move cephalad and mesad of 9 as interpreted in anophelines.
8. Hair 8 is always lateral and placed far forward on the segment.
- *9. Hair 9 is ventrolateral in position. In anophelines it has been confused with hair 7 on segments III to VII as indicated above. It is normally slightly cephalad of hair 6 and does not move caudad of it.
10. Hair 10 always retains its relation to hair 9. It is usually mesad and caudad of this hair although in some forms it may move cephalad of 9.
- 11 & 12. Hairs 11 and 12 are subject to much change in position. When they move cephalad or mesad, the more cephalic hair is arbitrarily called hair 11.
13. Hair 13 is usually easily recognized as it has a tendency to become stellate or multibranched and is the most median and caudal of the ventral hairs. On segment VI it has a tendency to move forward, become reduced in size and in most culicines develop a dendroid branching.
14. Hair 14 is minute in anophelines and placed in the intersegmental membrane in front of the segment. It is also minute in culicines but is very well developed in some sabethines. The two members of a pair are usually very closely associated on the midventral line.

In *general homologies* the hairs are first selected on segment II using the characteristic positions described above and taking into account the usual migrations. On the dorsal surface it is easiest to select hair 1 first then 6, 5 and 8. Hair 4 then becomes obvious and it remains to decide on hairs 2 and 3. Hair 7 can be determined in its relation to 6. On the ventral surface hair 13 is first decided on and then hairs 9 and 10. Following that hairs 11 and 12 present no difficulties. Hairs 0 and 14 are left for the last step. It should be emphasized that only after the pattern for segment II has been established is it advisable to attempt *serial homologies*. These are carried out in the same steps from segment to segment, additional help is derived from the characteristic development and branching of hairs which have a characteristic position.

Although segment VII has the same number of hairs as the 5 preceding segments the chaetotaxy is considerably modified in culicines and homologies are more difficult to determine. The situation is complicated by the movement of most hairs into a compact lateral group. The chaetotaxy of this segment provides valuable diagnostic characters so that it becomes necessary to homologize it carefully. It appears that in the past this has been done

largely by direct comparison with anopheline chaetotaxy of this segment and this has led to misinterpretations. The same procedure should be followed as outlined above but the following additional notes may prove to be of help. Hairs 1 and 13 are usually strongly developed and easily determined since they retain their usual position. Hair 8 is placed forward of all the other hairs and is usually a small multibranching tuft. Hair 3 is well developed and is the third hair from the middorsal line. Hair 5 is usually small in culicines and apparently is subject to migration on this segment towards the midventral line. Hair 4 is strongly developed. Hair 6 is greatly reduced in most cases but usually retains its branched condition. Hair 7 retains its relation to 6, being ventrad and caudad of 6. Hair 9 is cephalad and ventral of 6 as on the other segments. The hair nearest to 9 ventrally is hair 10. Hairs 11 and 12 show the usual migration.

ABDOMINAL SEGMENT I

The first abdominal segment usually carries 12 pairs of hairs. It was formerly generally accepted that hairs 0, 14, and 8 were absent from this segment. This appears to be the condition in anophelines but undoubtedly is not always so in culicines and sabethines. The latter show particularly interesting developments which throw some light on the entire problem of larval chaetotaxy. On the dorsal surface of the abdominal segments certain species of *Tripteroides* have an extremely well developed hair 0. A hair in exactly the same position occurs on segment I of these species and hair 2, which on segment II and following also has a characteristic position, is absent. In other species of *Tripteroides* hair 0 is lacking on segment II and may be absent or present on the more distal segments, in such species hair 2 is present on the first segment and occurs in almost exactly the same position as on segment II. On the ventral surface hair 14 may be extremely well developed in the intersegmental membrane. In at least one species of *Tripteroides* it is present on segment I in exactly the same position. The most convincing evidence that different hairs are present on this segment is to be deduced from the fact that in this particular group of *Tripteroides* the above mentioned species with hair 14 is the only one which has 4 pairs of ventral hairs on segment I, the others all have 3 pairs only, one less than the usual condition in most mosquitoes. It is also probable that the hair which has been interpreted as hair 9 on this segment may be actually hair 8. Such is the case in other species of *Tripteroides* in which hair 8 is characteristically developed on all the segments and is present in exactly the same dorsolateral position on segment I as on all others. Hair 9 as mentioned in the general discussion above is ventrolateral in position always. Hair 8 has a characteristic lateral or dorsolateral position in all forms examined. In *Uranotaenia*, members of the typical subgenus appear to have retained hair 8 on the first abdominal segment, while in *U. quadrimaculata* of the subgenus *Pseudoficalbia* it is obviously hair 9 that is retained and 8 lost. It appears, therefore, that potentially every one of the 15 pairs of hairs may appear on this segment and homologies on this segment may be of considerable phylogenetic interest and should be done very carefully. Homologies

are complicated by the fact that hairs 0 and 14 may be either well developed or so small and inconspicuous that they are overlooked in related species and particular attention should be paid to them. The author is fully aware that his present interpretations of the chaetotaxy of this segment are not entirely clear and considerable revision will be needed after more work is done.

ABDOMINAL SEGMENT VIII

The eighth abdominal segment, the spiracular lobe of anophelines and the siphon of the culicines present a special problem in nomenclature. It appears quite evident, as shown by Christophers and Martini, that the siphon of the culicines with its valves and the spiracular lobe with the perispiracular apparatus are homologous structures and are derived from part of the eighth and from the ninth abdominal segments and that the hairs located on these two structures belong to different segments. What is usually called the eighth segment has the chaetotaxy greatly reduced as a result. On the other hand the homologies of these hairs with those of the preceding abdominal segments are not clear by any means nor does it seem probable that they can ever be determined with any degree of certainty, as can be seen by examining the great variety of interpretations which have appeared in print. Martini used numbers to designate the hairs belonging to the eighth segment and letters for those of the ninth segment. When one attempts to use this mixed terminology on the siphon and valve hairs of the culicines, which show good specific and perhaps generic characters, a great deal of confusion results. It seems advisable, therefore, to treat the eighth abdominal segment proper separately from the spiracular lobe and the siphon and to use an arbitrary numerical designation for the hairs on these structures which does not imply homologies with the seventh or more proximal segments. The homologies of these hairs between anophelines and culicines are quite obvious and the proposed system would reflect this condition. No confusion should result from the use of this system in anophelines since the spiracular lobe is quite distinct from the eighth segment and the two groups of hairs could not be mixed.

The eighth abdominal segment proper bears five pairs of conspicuous hairs and in addition has two pairs of minute hairs. The latter are obviously homologous with hairs 0 and 14 of the preceding segments. The homologies of the other hairs are not clear, at least at the present time. For this reason these hairs are arbitrarily numbered 1 to 5 in a dorsoventral sequence. Should homologies be definitely established in the future, they could be renumbered.

- *0. This hair is minute, placed anteriorly on the dorsal surface of the segment in the same relative position as the corresponding hair on the preceding segment.
- *1. Hair 1 is the most dorsal of the well developed hairs of the eighth abdominal segment proper.
- *2. Hair 2 is ventrad and caudad of 1 in culicines, while in anophelines it is ventrad and cephalad of 1.
- *3. Hair 3 is the middle of the 5 lateral hairs and is usually conspicuously branched in anophelines as well as culicines.

- *4. Hair 4 is ventrad of 3.
- *5. Hair 5 is the most ventral of the conspicuous hairs.
- *14. The ventral intersegmental hair occurs in the same position as on the other abdominal segments. It is usually minute.

SPIRACULAR LOBE AND SIPHON

Thirteen pairs of hairs are of uniform occurrence on the spiracular lobe and perispiracular apparatus of the anophelines and the siphon and valves of culicines. In sabethines additional median ventral, median dorsal and lateral siphonal tufts are present but they do not occur in other forms and are, therefore, left out of consideration in the proposed nomenclature.

The pecten of anophelines is undoubtedly homologous with the pecten of culicines. Two hairs are associated with the pecten of anophelines. The dorsal of these, situated on the basal plate of the pecten, has been homologized with the dorsal preapical siphonal hair of culicines. The postspiracular hair of anophelines undoubtedly corresponds to the ventrolateral hair tuft of the culicine siphon. The siphon of culicines is considered to have been formed by the expansion and fusion of a structure corresponding to the basal plates of the two pectines over the dorsal surface and the expansion ventrally of their connecting ventral sclerotized bar. In the process the valves have been carried out away from the eighth abdominal and anal segments.

The hairs on these structures are numbered from the proximal end distad and from the base of the valves distad as follows. No homologies are implied with any hairs on the other portions of the abdomen.

- *1. Hair 1 is the siphonal tuft of culicines and the post spiracular hair of anophelines. In culicines where more than one pair is present they are designated as 1a, 1b, 1c from the base outward.
- *2. Hair 2 is the dorsal preapical siphonal hair of culicines and is located either in that position on the siphon or in a membrane just beyond its apex in some sabethines. In anophelines it is the basal pectinal hair.
- *3. Hair 3 is the proximal fossate hair of the middorsal valve on its lateral surface.
- *4. Hair 4 is the middle fossate of the middorsal valve and is usually better developed than either 3 or 5.
- *5. Hair 5 is the distal fossate hair of the middorsal valve.
- *6. Hair 6 is the proximal dorsal valve hair and is located on the lateral surface at the base of the dorsolateral valve.
- *7. Hair 7 is the distal dorsal valve hair and is located at the apex of the distal part of the dorsolateral valve.
- *8. Hair 8 is the proximal ventral valve hair and is located on the lateral surface at the base of the ventral valve.
- *9. Hair 9 is the distal ventral valve hair and is located preapically on the lateral surface of the ventral valve. It is often developed into a curved spine in culicines.
- *10. Hair 10 is the inner basal valve hair. Because of its position on the inner surface at the base of the ventral valve it is seldom seen.

- *11 & 12. Hairs 11 and 12 are the inner apical ventral valve hairs and are located near the apex of the lower inner surface of the ventral valve. They are seldom well developed.
- *13. Hair 13 is the median ventral valve hair, located on the upper inner surface of the ventral valve. In culicines it is frequently well developed and has an expanded base and a conspicuous proximal curvature in *Uranotaenia*.

THE ANAL SEGMENT

Four pairs or groups of hairs are of uniform occurrence on the 10th abdominal segment. No homologies with other abdominal hairs are implied on this segment.

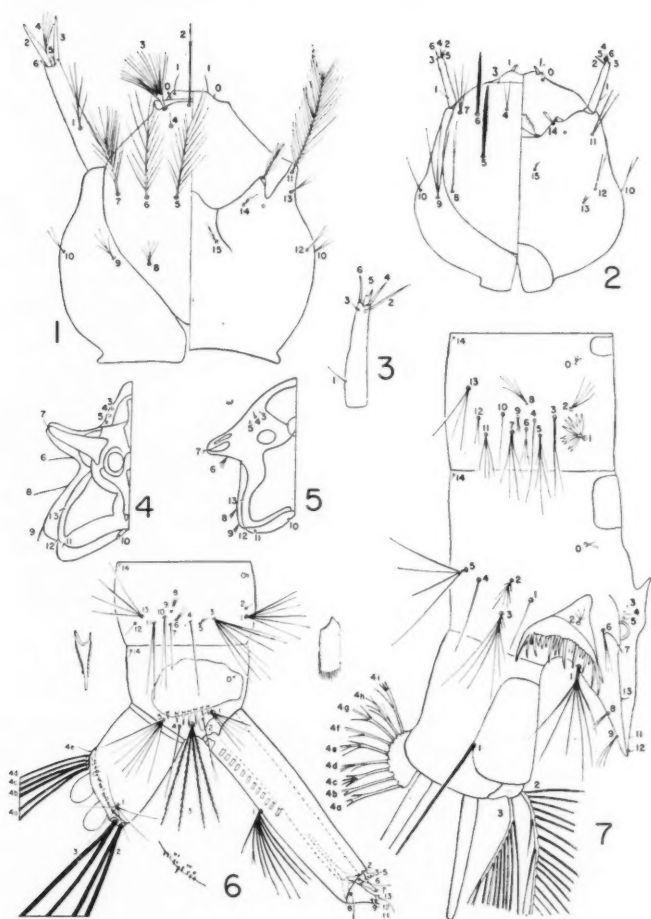
- *1. The lateral saddle hair arises laterally from the saddle.
- *2. The inner dorsal hair of the dorsal brush is the dorsal, upper, or inner component of the dorsal brush.
- *3. The outer dorsal hair of the dorsal brush is the ventral, lower, or outer component of the dorsal brush.
- *4. The ventral brush is composed of a variable number of paired or unpaired hairs. The most distal component of the brush is designated as 4a, the next proximad 4b, etc. . . . for ease of reference.

SUMMARY

A revised uniform numerical nomenclature for the chaetotaxy of the fourth instar mosquito larva is proposed. It can be applied uniformly to all members of the subfamily *Culicinae*. One hundred and ninety-three pairs or groups of hairs are included. Only the hairs of the mouthparts and the midventral, dorsal and lateral hairs of the culicine siphon are not taken into consideration. All the established homologies are retained in this nomenclature and a minimum of changes are introduced in the modified Martini system on which it is based. To allow for separate numerical sequence for the head appendages, the lateral and ventral head capsule hairs are renumbered. All the antennal hairs are given a separate numerical sequence. Prothoracic and mesothoracic hairs 13 and 14 are interchanged. Metathoracic hairs 1, 2, 3, 4 of anophelines are renumbered. No modifications are introduced into the proximal abdominal nomenclature except for the interchanging of hairs 7 and 9 in anophelines on segments III to VII and the possible occurrence of hairs 0, 8 and 14 on segment II. Separate numerical sequences not serially homologous with the remainder of the abdomen are introduced for the eighth abdominal segment proper, the spiracular lobe of anophelines and its homologue, the siphon of the culicines, and the anal segment. Criteria for general and serial homologies are discussed with the relative position of hairs considered to be of more importance than the development of hairs. A table indicating the changes and synonymy of the nomenclature is appended and drawings of *Anopheles walkeri* Theo. and *Uranotaenia atra* Theo., labelled with the revised nomenclature are given.

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Figs. 1-7.—1. *Anopheles walkeri* Theo. Dorsal and ventral aspects of head (After Hurlbut); 2. *Uranotaenia atra* Theo. Dorsal and ventral aspects of head; 3. *Uranotaenia atra* Theo. Dorsal aspect of left antenna; 4. Caudal aspect of left side of generalized culicine siphon with valves open (After Marshall); 5. Caudal aspect of left side of generalized anopheline perispiracular apparatus (After Marshall); 6. *Uranotaenia atra* Theo. Left lateral aspect of terminal abdominal segments; 7. *Anopheles walkeri* Theo. Left lateral aspect of terminal abdominal segments (Modified from Hurlbut).

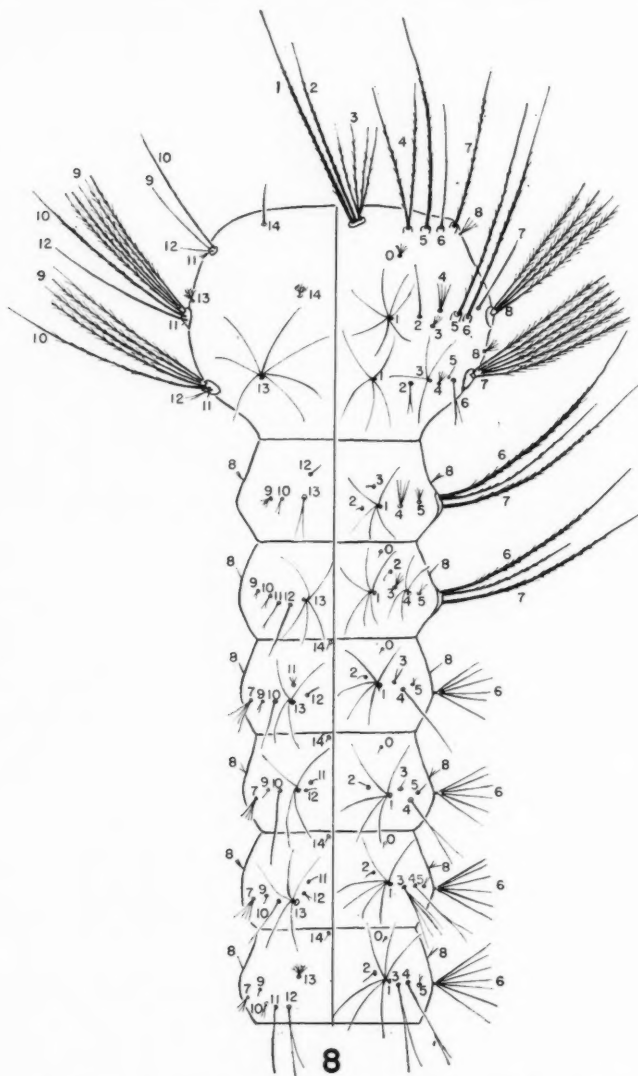


Fig. 8.—*Uranotaenia atra* Theo. Dorsal and ventral aspects of thorax and abdominal segments I to VI.

The North American Species of *Bembecinus*

(Hymenoptera, Sphecidae, Stizini)

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The taxonomy of the North American species of *Bembecinus* Costa has presented some difficult problems for many years. It has been only recently, with Arnold's¹ recognition of the phenomenon of xanthochroism increasing with the size of the male in certain species, that an explanation has been offered which makes it possible to solve some of the problems.

Recently the senior author had occasion to arrange the North American material of this genus in the collection of the U. S. National Museum, while the junior author at Cornell University examined some North American material in connection with his studies of the Neotropical fauna. Finding that we were in substantial agreement on the status of the North American forms, we decided to pool our specimens and present the following results of our investigations.

Mr. Robert B. Benson, of the British Museum (Natural History), has very kindly compared specimens and notes sent him with types or type material of the Smith and Cameron species discussed herein. Dr. Franz Maidl, of the Naturhistorisches Museum of Vienna, made available a paratype of *Stizus xanthochrous* Handlirsch. Mr. Martin H. Muma, of the University of Nebraska, loaned specimens from the University of Nebraska collection determined by Mickel, including paratypes of *strenuus* (Mickel). Specimens in the collections of the U. S. National Museum, Cornell University, Museum of Comparative Zoology, University of Kansas, University of Michigan, University of California, Berkeley, California Academy of Sciences, and several private collections have been studied during the course of our investigations.

The basis for existing classifications has been the treatment by Handlirsch.² Fox,³ Johnson and Rohwer,⁴ Rohwer,⁵ and Mickel⁶ have adapted and ex-

¹ Arnold, G., 1944. The Sphecidae of Madagascar. Cambridge Univ. Press, pp. 68-72.

² Handlirsch, A., 1892. Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Cl. 101: 25-205, 3 pls.

³ Fox, W. J., 1895. Proc. Acad. Nat. Sci. Phila., pp. 266-8.

⁴ Johnson, S. A., and S. A. Rohwer, 1908. Ent. News 19: 373-4.

⁵ Rohwer, S. A., 1909. Univ. Colo. Studies 6: 243, 246-8, figs. 1-3, 8.

⁶ Mickel, C. E., 1917. Univ. Studies, Univ. Nebr. 17: 433-5.

panded Handlirsch's tables for all or part of our North American species. The chief difficulty has been caused by the separation of males by color, whether they are black with paler markings or yellow with some black markings. This method of separation may have seemed satisfactory at the time it was proposed with the short series showing only the extremes in the extent of the pale maculations, but in *godmani* it breaks down entirely with the long series now available exhibiting a complete intergradation between more or less melanic and the extreme xanthochroic forms.

All the North American species of *Bembecinus* belong to the Tridens Group, distinguished in the male among other characters by having the apex of the ninth flagellar segment beneath drawn out into a long curved spine. Workers in the past have assumed that this was just a simple spine. Actually the spine is shorter than it seems, and closer examination shows that it bears at its tip one or two flattened, curved setae about one-fourth to one-third as long as the spine itself (Fig. 3A). In one case the confusion as to the character of this spine has led to a misinterpretation, for Fox stated that *godmani* had this spine short, straight and indistinct rather than long, curved and prominent, as in *nanus*. Actually he must have based this statement on an antenna in which the apical setae were broken off, for we can detect no appreciable differences in length and shape of the spine plus apical setae in the two species.

The phenomenon of xanthochroism in our species is not, at least with respect to the markings on the legs and abdomen, a matter of the extension of the basic pale maculations, but an actual replacement of areas which are normally black by a yellow which is richer and darker than that of the basic pale maculations. This is readily seen in xanthic individuals of *godmani* where the basic maculations, such as the bands at the apices of the abdominal tergites and stripes on the outer sides of the tibiae, are pale ivory and form a noticeable contrast to the golden yellow basal parts of the tergites and tibiae within, which are normally black. Females of *godmani* rarely show any tendency toward xanthochroism. The phenomenon occurs, so far as known, in males of only three of our species, *neglectus* (Cresson), *godmani* (Cameron), and *wheeleri*, new species. The males of *neglectus* apparently nearly always occur only in the extreme xanthic form, a fact which has led to male *neglectus* being called *xanthochrous* by American authors rather than being recognized as the male of *neglectus*.

It is not known what causes this replacement of the normal black color in males, though perhaps the amount or kind of food available to the larva may be the determining factor, as increased size in the male seems to be correlated with increased amount of yellow. It is not a matter of distribution, since the extremes in coloration together with all intergrades may occur in one circumscribed area. Nor does it seem that a lack of humidity may be a determining factor, for while the only North American species exhibiting xanthochroism occur in the drier parts of the country, such species as the Solomon Islands *anthracinus* (Handlirsch), the New Guinea *papuanus* (Cameron), and the Madagascan *mirus* (Arnold), *assentator* (Arnold) and *varians* (Arnold) also

show xanthochroism in the males and are found in very humid climates. Nor do the data at hand indicate that a seasonal form is involved, for all intergrades of *godmani* occur throughout the season in various parts of the range.

Our experience has been that the male genitalia are of value in the differentiation of groups of species, but show variation of such a character that they cannot be used satisfactorily for the separation of closely allied forms. The genitalia of *godmani* are quite distinct from the other species occurring in North America as may be seen by reference to the accompanying figures (Figs. 1, 2). We have been unable to find differences of importance in the integumental punctuation except in the case of *wheeleri*, new species.

The North American species of *Bembecinus* Costa were formerly placed in *Stizus* Latreille, but are readily separated by a combination of the concave posterior surface of the propodeum and the cubital vein of the hind wing not being continued as a spur beyond the apex of the median cell. Parker⁷ presented a key for the separation of the genera of Stizini occurring in North America. Dow⁸ published a key to the North American species of *Stizus*. The third genus, *Stizoides* Guérin, is represented in this region by only one species, *unicinctus* (Say).

KEY TO THE NORTH AMERICAN SPECIES OF BEMBEICINUS

1. Second submarginal cell petiolate, the petiole long, never less than one-fifth the distance between the radial and cubital veins; seventh sternite of male longitudinally carinate in middle; interocular distance at base of clypeus of male slightly less than combined length of first two flagellar segments (ratio of about 7:8); hind basitarsus of male half the length of hind tibia; seventh to ninth flagellar segments of male broader than long (Fig. 4) *godmani godmani* (Cameron)⁹
- Second submarginal cell usually not petiolate, the first and second transverse cubital veins either narrowly separated above or meeting at the radial vein, if petiolate rarely in *nanus*), the petiole shorter, never more than one-seventh the distance between the radial and cubital veins; seventh sternite of male without such a carina except in *neglectus* where it is much weaker; interocular distance at base of clypeus of male subequal to or greater than combined length of first two flagellar segments (ratio varying from 7:5.5-7.0); hind basitarsus of male relatively longer, varying from 0.6 to 0.8 the length of hind tibia; seventh to ninth flagellar segments of male as long as broad (Fig. 3), or longer than broad, except in *wheeleri* where the eighth and ninth are broader than long 2
2. Seen in profile the upper posterolateral angle (UA) of the propodeum (Fig. 5) broadly rounded and not extending as far caudad as the acute, lower posterolateral angle (LA); concavity of propodeum shallower 3
- Upper posterolateral angle (Fig. 6) more narrowly rounded and extending as far caudad as the acute lower angle; concavity of propodeum deeper 4

7 Parker, J. B., 1929. Proc. U. S. Natl. Mus. 75, Art. 5: 8, pl. 1, figs. 1-6.

8 Dow, R., 1941. Psyche 48: 179-181.

9 *B. godmani bolivari* (Handlirch), the other subspecies, occurs in South America. It is distinguished from typical *godmani* by having the pubescence of front of head and mesonotum brownish instead of whitish, and the wings slightly infumated instead of hyaline.

3. Dorsum of thorax and abdomen with closer punctures; male with interocular distance at base of clypeus much greater than combined lengths of first two flagellar segments (7:5.0-5.5), seventh and eighth flagellar segments as long as broad, seventh sternite with very dense small punctures and a few scattered larger ones; females with hind femur and all tibiae and tarsi with some ferruginous, the clypeus and supraclypeal area almost entirely pale; Texas *bishoppi*, new species

Dorsum of thorax and abdomen much more sparsely punctate; male with interocular distance at base of clypeus very slightly greater than combined lengths of first two flagellar segments (7:5.8-6.7), seventh and eighth flagellar segments broader than long, seventh sternite with the small punctures almost entirely lacking; females with no ferruginous on tibiae or hind femur, supraclypeal area black, clypeus black except in one specimen which has oblique lateral pale spots; Arizona *wheeleri*, new species

4. Pilosity much shorter, not particularly noticeable, that on last tergite of female brown, on last two tergites of male pale as on preceding tergites; apical margin of clypeus of female truncate on middle two-thirds, rounding evenly toward the eyes and without a tuft of short curled hairs at the angle; sixth sternite of male with apical margin almost straight; terminal flagellar segment of male with a small tubercle beneath in middle; male always nearly entirely yellow; larger species, usually 11-13 mm. long *neglectus* (Cresson)

Rather densely long-pilose forms, the pilosity on the abdomen especially conspicuous, that of last tergite of female and last two tergites of male black (occasionally paler in a few specimens of *nanus strenuus*); apical margin of clypeus of female slightly concave on middle two-thirds, with a conspicuous angle bearing a tuft of short curled hairs where the margin turns toward the eyes; sixth sternite of male with apical margin broadly and noticeably emarginate; terminal flagellar segment of male concave beneath, rarely tuberculate in middle, but if so, never as strongly as in *neglectus*; male never nearly entirely yellow, always similar to female in extent of pale maculations; smaller species, rarely more than 10 mm. long *nanus* (Handlirsch) 5

5. Markings of abdomen rich golden yellow; clypeus and supraclypeal area of female almost always with some black areas: sternite two of female with a large triangular posterolateral yellow spot, three and four occasionally with smaller ones, band on fifth tergite; tibiae and tarsi of both sexes entirely yellow except for small dark spots beneath on fore and mid tibiae (occasionally also beneath on hind tibia of male); N. J. to northern Fla. and Miss. Riv. drainage system east of 100th meridian *nanus nanus* (Handlirsch)

Markings of abdomen pale creamy; clypeus and supraclypeal area of female *n. strenuus* entirely yellow (female of *n. floridanus* unknown), band on fifth tergite rarely complete, usually represented by one or three spots or rarely entirely absent 6

6. Female unknown; tibiae and tarsi usually entirely pale; second to fourth or fifth sternites with moderately large, triangular posterolateral pale spots decreasing in size on posterior sternites; band on first tergite never interrupted, though usually narrowed in middle; spot on posterolateral angles of propodeum large; southern Fla. *nanus floridanus*, new subspecies

All tibiae and tarsi of both sexes rather conspicuously maculated with black; sternites immaculate, or occasionally (a few males) with very small posterolateral pale maculae on second and third; males with band on first tergite frequently interrupted medianly, and posterolateral spots on propodeum very small (normal in size in female); S. Dak., Nebr., and Tex., usually west of 100th meridian *nanus strenuus* (Mickel)

BEMBEVINUS GODMANI (Cameron)

(Figs. 1, 4)

- Stizus godmani* Cameron, 1890. Biol. Centr.-Amer., Hym. 2, pl. 5, fig. 8 (♀, ♂; Mexico, Guatemala).—Rohwer, 1909. Univ. Colo. Studies 6: 246-7 (biological observations on the three varieties of *godmani*).—Rohwer, 1914. Proc. U. S. Natl. Mus. 47: 516.—Mickel, 1917. Univ. Studies, Univ. Nebr. 17: 433-4.
- Stizus agilis* (Smith), Cameron, 1890. Biol. Centr.-Amer., Hym. 2: 102 (misdetermination).
- ? *Stizus lineatus* Cameron, 1890. Biol. Centr.-Amer., Hym. 2: 102, pl. 5, fig. 7 (♂; Mexico).—Handlirsch, 1892. Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Cl. 101: 64.—Dalla Torre, 1897. Cat. Hym. 8: 526.
- Stizus flavus* Cameron, 1890. Biol. Centr.-Amer., Hym. 2: 103, pl. 5, fig. 9 (♂; Mexico, Guatemala).—Handlirsch, 1892. Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Cl. 101: 63, pl. 1, figs. 9, 20.—Fox, 1895. Proc. Acad. Nat. Sci. Phila., pp. 267-8. Dalla Torre, 1897. Cat. Hym. 8: 524.—Mickel, 1917. Univ. Studies, Univ. Nebr. 17: 433.
- Stizus Godmani* Cameron, Handlirsch, 1892. Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Cl. 101: 58.—Fox, 1895. Proc. Acad. Nat. Sci. Phila., pp. 266-7.
- Stizus godmanii* (sic!) Cameron, Dalla Torre, 1897. Cat. Hym. 8: 524.
- Stizus flavus* var. *subalpinus* Cockerell, 1898. Proc. Davenport Acad. Nat. Sci. 7: 142 (♂; Santa Fe, New Mexico).
- Stizus* (*Stizus*) *godmani* Cameron, Johnson and Rohwer, 1908. Ent. News 19: 373-4.
- Stizus* (*Stizus*) *subalpinus* Cockerell, Johnson and Rohwer, 1908. Ent. News 19: 373-4.
- Stizus godmani godmani* Cameron, Rohwer, 1909. Univ. Colo. Studies 6: 247-8.
- Stizus godmani lineatus* Cameron, Rohwer, 1909. Univ. Colo. Studies 6: 248.
- Stizus godmani flavus* Cameron, Rohwer, 1909. Univ. Colo. Studies 6: 248.
- Bembicinus* (sic!) *godmani* (Cameron), Parker, 1929. Proc. U. S. Natl. Mus. 75, Art. 5: pl. 1, figs. 3, 4.—Strandtmann, 1945. Ann. Ent. Soc. Amer. 38: 312-3.
- Bembicinus* (sic!) *Godmani* (Cameron), Rodeck, 1931. Jour. Colo-Wyo. Acad. Sci. 1, No. 3: 61.

The synonymy given above is correct to the best of our knowledge, though the status of *lineatus* is still questionable since the type cannot be located. The senior author sent Mr. Benson a series of typical *godmani* including the most melanic and most xanthic specimens as well as several intergrades for comparison with the Cameron types. Mr. Benson wrote as follows: "The trouble with the 'godmani' group is that we have no labelled specimen of 'lineatus' at all and no selected type of 'godmani' or 'flavus.' There are two specimens from the Biologia Centrali-Americana material labelled 'Atoyac in Vera Cruz' and one of these might be considered as the type of 'godmani' and is closest to the dark specimens of yours so labelled, while your pale specimen is certainly the closest to 'flavus.'" The description and figure of *lineatus* agree with specimens of *godmani godmani* intermediate between the melanic and xanthic extremes of variation. The type of *flavus* var. *subalpinus* Cockerell, in the U. S. National Museum, is only an extremely yellow individual of *g. godmani*.

The typical subspecies is a wide-ranging form extending from Nebraska, Colorado, Texas, New Mexico, Arizona and southern California southward at least to Panama. The junior author has established that it intergrades in

southern Central America with *godmani bolivari* (Handlirsch), which has an extensive distribution in South America.

The structural characters mentioned in the key will serve to separate this form readily from all others in North America.

Female.—Pale markings in darkest specimens as follows: Labrum except base, clypeus except quadrate spot in middle, supraclypeal area, narrow line along inner eye margins extending to a point halfway between antennal insertions and anterior ocellus, scape and flagellum beneath, narrow line along posterior margin of pronotum, base of tegula, posterolateral angles of scutum, lateral quadrate marks on scutellum, transverse band on postscutellum, angles of propodeum, fore and mid femora with a stripe beneath, fore tibia beneath, mid tibia with an anterior stripe, posterior tibia with a stripe on outer surface, fore tarsus except posterior half of basal segments, narrow annulations at apices of segments of mid and hind tarsi, tergites one to five with complete bands apically, that on the first the broadest and narrowed in middle anteriorly, the remaining ones progressively narrower and emarginate anteriorly on each side of midline. Maculations on head and thorax are ordinarily lemon yellow, on legs and abdomen creamy.

Apparently there normally is not much variation from the above pattern in the females. We have seen one female from Boulder, Colorado, recorded by Rohwer, 1909, as *godmani lineatus*, which is unusual in being extensively yellow. It agrees closely with Rohwer's figure of that supposed variety.

The darkest males agree closely with the above description with the exception of having a pale apical band on the sixth tergite, and intergrade completely to the so-called *flavus* form, which may be entirely yellow except for a few small, scattered black areas (not always symmetrical) on front, vertex, scutum and last three sternites. As noted in the introductory remarks, the yellow markings which replace the black are of a richer shade than the normal pale maculations.

Rohwer, 1909, recorded a colony nesting in a sandy creek bed at Boulder, Colorado. An area of about 150 square feet was closely packed with burrows, many of them only 3 or 4 inches apart. The burrow was described as being straight, at an angle of 90° (!) with the surface, 8 cm. in diameter, 40 cm. long and ending about 13 cm. below the surface. The cell was provisioned with small dealated flies. This prey record is most unusual, for the other published records state that leafhoppers are used. Either the species is not so selective in prey preference as the other records indicate, or perhaps the *godmani* burrow was lost during excavation and the contents of the cell of a different wasp taken to be those of *godmani*. Rodeck reported it as nesting in sand at Roggen, Colorado, the burrows running about 45° from the horizontal and extending 6 inches below the surface. The prey used consisted of leafhoppers, *Cuerna costalis* (Fabricius) and *Draeculacephala noveboracensis* (Fitch), only one of the six burrows examined containing both species of leafhoppers. Strandtmann also recorded it as nesting in sandy soil. Leafhoppers

taken from the females were adults of *Ciminius hartii* (Ball) and *Stirellus bicolor* (Van Duzee), and nymphs of *Exitianus* sp. and *Cuerna* sp.

Mr. Paul D. Hurd, Jr., of the University of California at Berkeley, has forwarded for examination a series of 47 females and 1 male *g. godmani* taken at Blythe, California, by W. F. Barr on August 4, 1946. This series represented part of an aggregation of this species which formed a ball about one inch in diameter near the top of a *Pluchea sericea* bush.

BEMBEICINUS MONEDULOIDES (Smith)

Larra moneduloides Smith, 1856. Cat. Hym. Brit. Mus. 4: 346-7 (♀, type, not the ♂ "allotype"; St. Johns Bluff, Florida)

Stizus moneduloides (Smith), Patton, 1879. Bul. U. S. Geol. Surv. 5: 347.—Handlirsch, 1892. Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Cl. 101: 69-70.—Fox, 1895. Proc. Acad. Nat. Sci. Phila., p. 268.—Dalla Torre, 1897. Cat. Hym. 8: 527.

Bembecinus moneduloides (Smith), Cresson, 1887. Trans. Amer. Ent. Soc. Suppl. Vol. 7: 278.

We had supposed at first that *n. nanus* (Handlirsch) was a synonym of this species. However, after comparing material of *n. nanus* with the type series of *moneduloides*, Mr. Benson wrote as follows: "the type of *Larra moneduloides* Smith is ♀, but is quite unlike the specimens you send named *nanus* although it appears to be a *Bembecinus*. Firstly the sculpture of the 1st tergite is quite different and secondly the colour of the legs is very distinctive as correctly described by Smith." Smith described the female as having the fore and middle tibiae and all tarsi yellow, the later with a ferruginous tinge, and the hind tibia with a yellow stripe at base above. Later, when the male specimen described here as *nanus floridanus* came to our attention, one of these was sent to Mr. Benson. He wrote the senior author under date of July 27, 1949 as follows: "... I can tell you that the male paratype of *L. moneduloides* is *B. nanus floridanus*, but this does not alter the fact that the female Holotype is of an entirely different species which is not dealt with in your key; ... The most outstanding character [of *moneduloides*] is in the pubescence of the abdomen, which is denser, shorter than in *nanus* and adpressed; on the last tergite the pubescence is very close in the middle, short and outstanding laterally and the whole of this tergite is more closely punctate than in *nanus*; and so is the 1st tergite. Propodeum less strongly excised than in *nanus* but with strong lateral angles. ... Clypeus hardly emarginate apically, broadly black in the middle and pale round the edges; supraclypeal area yellow."

Additional material, especially females, from Florida will be needed before the status of *moneduloides* can be finally determined.

BEMBEICINUS NANUS NANUS (Handlirsch)

(Figs. 2, 6)

Stizus nanus Handlirsch, 1892. Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Cl. 101: 61 (♀, ♂; Georgia).—Fox, 1895. Proc. Acad. Nat. Sci. Phila., pp. 266-7.—Dalla Torre, 1897. Cat. Hym. 8: 527.—Mickel, 1917. Univ. Studies, Univ. Nebr. 17: 433-4.

Bembecinus nanus (Handlirsch), Shappirio, 1946. Ent. News 57: 229-230.

The typical subspecies is rather readily recognized by the characters listed in the foregoing key. The second submarginal cell is occasionally petiolate, but the petiole is always shorter than in *godmani*.

On the east coast it extends as far north as central New Jersey (Browns Mills) in the coastal and Piedmont areas, is present in the Gulf States to Texas (Bastrop, Brazos, Robertson and Lamar counties), and penetrates the Mississippi River drainage system to a considerable extent as we have seen specimens from Iowa (Sergeant Bluff) and eastern Nebraska (Carns). In Florida it apparently occurs only in the northern half (Monticello, Eustis, Gainesville and Orange Co.), and is replaced to the south by *n. floridanus*.

Female.—Pale markings rich golden yellow, as follows: Base of mandible, labrum, clypeus except for base and usually a median quadrate spot, supra-clypeal area usually mostly black, short narrow stripe along inner eye margin extending from clypeus or lower margin of antennal insertions half way to anterior ocellus, scape and flagellum beneath, narrow band on dorsum of pronotum and tubercles, posterolateral mark on scutum, oblique quadrate spots laterally on scutellum, transverse band on postscutellum, posterolateral angles of propodeum with spot, fore femur behind on apical half, apices of mid and hind femora, tibiae and tarsi entirely except for a small dark spot beneath on former and a ferruginous tinge on the latter, tergites one to five with apical bands of same form as *g. godmani*, though the first not so much narrowed in middle, sternite two with triangular posterolateral mark, and sternites three and four occasionally with similar ones.

Males are very similar in color pattern with the following exceptions: Clypeus entirely and supraclypeal area largely yellow, occasionally a spot on upper part of mesopleuron, fore and mid femora entirely yellow beneath, and sixth tergite with a small or large spot along middle of apical margin. Males are never xanthochroic.

A West Point, Nebraska, male determined as *nanus* by Mickel is perhaps best considered an intergrade between *n. nanus* and *n. strenuus*, since the abdominal markings are paler than in the typical form, but the hind tibia and tarsus lack the black maculations of *n. strenuus*.

Shappirio recorded *n. nanus* as being caught with a leafhopper, *Graphocephala versuta* (Say) and unidentified fulgorids.

Bembecinus nanus floridanus, new subspecies

Larra moneduloides Smith, 1856. Cat. Hym. Brit. Mus. 4: 347; (♂ "allotype," not the ♀ type; St. Johns Bluff, Florida).

The present form, which replaces typical *nanus* in southern Florida, is known as yet from males only.

Type: ♂; Miami, Florida; April 11 (D. M. DeLong) [U. S. National Museum, Type No. 59352].

Male.—Length 10 mm., forewing 5.5 mm. Similar to male of *n. nanus* in color pattern, but the pale maculations of abdomen creamy.

Paratypes: 1 ♂; South Miami, Florida; May 30. 2 ♂♂; Larkins, Florida; April. 2 ♂♂; same data, but May. 3 ♂♂; Hollywood, Florida; May 6. All the foregoing collected by S. Graenicher [Museum of Comparative Zoology]. 1 ♂; Estero, Florida (Van Duzee) [American Museum of Natural History]. 1 ♂; Fort Lauderdale, Florida; August 29, 1925 (T. H. Hubbell) [University of Michigan]. Paratypes are in the collections of the U. S. National Museum, Cornell University, University of Michigan, the British Museum (Natural History) and the Universidad Nacional de Tucuman. An additional specimen from Hollywood is excluded from the type series, as the head and abdomen are missing.

Paratypes vary in length from 8 to 10 mm. Three of them have some black markings on the hind tibia and tarsus.

***Bembecinus nanus strenuus* (Mickel), new status**

Stizus strenuus Mickel, 1917. Univ. Studies, Univ. Nebr. 17: 331-2 (♀, ♂; Bridgeport, Nebraska).—Mickel, 1917. Univ. Studies, Univ. Nebr. 17: 433-4.

Bembecinus (sic!) *strenuus* (Mickel), Lohmann, 1943. Mitth. Münch. Ent. Ges. 33, h. 1: 193.

This subspecies replaces the typical form in the more arid parts of the west, and we have seen two paratypes from Bridgeport in western Nebraska, one specimen from Hot Springs, South Dakota, and series from Torrington, Wyoming, and Victoria, Bastrop, Bexar and Llano counties in Texas. It is readily distinguished from *n. nanus* and *n. floridanus* by the foregoing key.

The specimens recorded as *moneduloides* by Cameron, 1890 (Biol. Centr.-Amer., Hym. 2: 104) from Presidio (Chihuahua—?) and Teapa, Tabasco, Mexico, and San Geronimo, Guatemala, and as *nanus* by Cheesman, 1929 (Trans. Roy. Ent. Soc. London 77: 151) from Panama are, perhaps, referable to the present form. Certainly they are not likely to be typical *nanus* or *n. floridanus*.

The basic color pattern in this subspecies is similar to that of *n. nanus*, though like *n. floridanus* the present form has creamy abdominal maculations rather than rich golden yellow. The essential differences in pattern from *n. nanus* are as follows: Clypeus and supraclypeal area entirely yellow; band on fifth tergite of female and sixth tergite of male lacking or represented by one to three spots; female sternites immaculate, in male sometimes with very small posterolateral spots on second and third, spots on propodeal angles of male smaller; hind tibia and tarsus in both sexes with varying amounts of black, never entirely yellow; band on first tergite of male frequently interrupted at midline.

BEMBEICINUS NEGLECTUS (Cresson)

(Fig. 3)

Monedula neglecta Cresson, 1872. Trans. Amer. Ent. Soc. 4: 222 (♀; Comal Co., Texas).

Bembecinus neglectus (Cresson), Cresson, 1887. Trans. Amer. Ent. Soc. Suppl. Vol. 7: 278.

Stizus xanthochrous Handlirsch, 1892. Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Cl. 101: 69, pl. 1, figs. 10, 19 (♂; Dallas, Texas).—Fox, 1895. Proc. Acad. Nat. Sci. Phila., pp. 267-8 (♂).—Dalla Torre, 1897. Cat. Hym. 8: 534.—Mickel, 1917. Univ. Studies, Univ. Nebr. 17: 434 (♂). New synonymy.

Stizus neglectus (Cresson), Handlirsch, 1892. Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Cl. 101: 70-1.—Fox, 1895. Proc. Acad. Nat. Sci. Phila., pp. 266, 268 (♀). —Dalla Torre, 1897. Cat. Hym. 8: 528.—Mickel, 1917. Univ. Studies, Univ. Nebr. 17: 433, 435 (♀).

This is the largest *Bembecinus* in the United States, the body length varying from 11 to 13 mm., whereas in the species discussed previously the length usually varies from 8 to 10 mm. *Neglectus* is quite distinct too in several other characters, such as the subtruncate clypeal margin in the female lacking the lateral tufts of curled hair, and the well-developed tubercle beneath in the middle of the last flagellar segment of the male. We have never seen a male approaching the basic maculation pattern exhibited by the female, a condition which is also apparent in the Solomon Islands *anthracinus* (Handlirsch). Males are always very extensively marked with yellow, and superficially might be confused with the more extensively maculated males of *g. godmani*. The latter, however, has the yellow a much deeper shade than in *neglectus*.

The synonymy of *xanthochrous* made above is based on examination of one specimen from the original type series from Dallas, Texas, kindly made available by Dr. F. Maidl. Handlirsch's figures are erroneous, or else represent another species, as he shows the last flagellar segment as being non-tuberculate beneath and the hind tibia not incrassate. The specimen sent by Dr. Maidl does not agree with either of the illustrations with respect to these characters.

We have seen specimens from Nebraska (Omaha), Texas (Cypress Mills, Dallas and Llano Co.), Louisiana (Bogalusa) and Mississippi (Oxford).

Female.—Yellow markings as follows: Mandible except tip, labrum, clypeus, supraclypeal area, line along inner eye margins almost to anterior ocellus, scape and flagellum beneath, band on posterior margin of pronotum, base of tegula, narrow band along lateral margin of scutum on posterior two-thirds, small spot of varying extent on upper part of mesopleuron, oblique, subquadrate lateral spots on scutellum, narrow line along posterior margin of post-scutellum almost interrupted at midline, small spot on propodeal angles, coxae, trochanters and femora beneath, tibiae and tarsi entirely except for small spots beneath on former and spot above on last segment of hind tarsus, apical bands on tergites one to five similar in conformation to those of *godmani*, sternites two to five with apical bands which are very narrow except laterally, or sometimes with only lateral spots.

Male.—Always extensively maculated with very pale yellow. Black markings in the most extensively yellow forms as follows: Tip of mandible, scape and flagellum above, irregular spots on upper front and vertex, three longitudinal bands on scutum, scutellum and postscutellum narrowly at base, spot on mesosternum, hind femur behind at tip, small paired spots on base of first tergite, retracted parts of other tergites and small lateral spots on third to sixth tergites, paired oval spots on sternites two to five increasing in size posteriorly, and all of six and seven except apices narrowly. In the specimens with the least yellow the spots on front and vertex coalesce; likewise the bands on

scutum coalesce anteriorly and posteriorly, spots are present on the propodeum, and the black on the abdomen is greatly increased, though never as much is present as in the female.

***Bembecinus wheeleri*, new species**

This and the following species are unique among North American forms, in that the upper posterolateral angles of the propodeum are not strongly compressed and do not extend so far caudad as the lower posterolateral angles. The male of *wheeleri* differs from all other species but *godmani* in the relatively broad seventh and eighth flagellar segments. In color pattern and wing venation it is similar to *nanus strenuus*, but the resemblance is superficial only, for the present form lacks the abundant pilosity and the structure of the antennae is much different. The genitalia are similar to the other species, and unlike *godmani*.

Type: ♂; Fort Grant, Pinaleno Mts. (5000 ft. elev.), Arizona; July 18, 1917 (Wheeler) [Museum of Comparative Zoology].

Male.—Length 8.2 mm., forewing 6.1 mm. The following markings pale yellow: Palpi, mandible except tip, labrum, clypeus, median triangular mark on supraclypeal area, narrow band along inner eye margins extending from base of clypeus two-thirds the distance to anterior ocellus, scape and flagellum beneath, band on posterior margin of pronotal disk including lobes, narrow band along lateral margin of scutum extending from apex three-fourths the distance to base, oblique lateral subquadrate spot on scutellum, transverse band on postscutellum, small, narrow line on posterolateral angles of propodeum, fore and mid coxae with a spot near apex beneath, fore femur posteriorly, mid and hind femora narrowly annulate at apex, tibiae and tarsi entirely except brownish spots beneath on former and posterior edge of hind tarsus, tergites one to five with apical bands, that of first relatively broad and narrowed slightly in middle on anterior margin, the remaining ones narrower and emarginate on each side of midline along anterior border, sternites two to four with triangular, posterolateral spots gradually diminishing in size, the fifth with a pale dot posterolaterally.

Structural characters of importance are as follows: Interocular distance at base of clypeus slightly greater than combined lengths of flagellar segments one and two (7:6.7), distance between lower margin of antennal socket and base of clypeus twice the distance between lateral margin of antennal socket and inner eye margin, ratio of interocular distance at base of clypeus to interocular distance across posterior ocelli as 1:2.3, seventh and eighth flagellar segments shorter than the apical width, the ninth about as long as wide at apex, the terminal segment beneath concave and with a well-developed median tubercle as in *neglectus*, dorsum of thorax and abdomen more sparsely punctate than in other species, posterior surface of propodeum very shallowly concave, the lateral angles not compressed or well-developed, hind tibia incrassate when viewed laterally, hind basitarsus 0.8 the length of hind tibia, second submarginal cell narrowed above, the first and second transverse cubital veins separated on radial vein by a distance equal to apical width of marginal cell, sixth sternite

with apical margin almost straight, and seventh sternite not carinate in middle, more sparsely punctate than *bishoppi*.

Allotype: ♀; Pena Blanca, Arizona; August 20, 1949 (Callaghan, Kaiser and Lindsay) [U. S. National Museum].

Female.—Length 8.7 mm., forewing 5.6 mm. Similar in coloration to the holotype with the following exceptions: mandible, labrum at base, clypeus and supraclypeal area, coxae, tibiae except for pale stripe on outer surface and tarsi except for pale stripe along inner edge of fore basitarsus and fore distitarsus above, black; only sternites two and three with posterolateral spots. Punctuation similar to holotype; ratio of interocular distance at base of clypeus to length of first two flagellar segments as 3:2.3, of the former distance to the interocular distance across the posterior ocelli as 1:2.4; first and second transverse cubital veins meeting just before the radial vein, so the second submarginal cell has a very short petiole.

Paratypes: 3 ♂♂; Tucson, Arizona (F. H. Snow) [University of Kansas]. 1 ♀; 18 miles south of Tucson; July 31, 1924 (E. P. Van Duzee) [California Academy of Sciences]. 1 ♂; 16 miles south of Tucson; August 11, 1924 (E. P. Van Duzee) [California Academy of Sciences]. 1 ♀; Pepper Sauce Canyon, Santa Catalina Mts., Arizona; August 16, 1924 (E. P. Van Duzee) [California Academy of Sciences].

The male paratypes collected by Snow are similar to the holotype in the extent of coloration and vary in length from 7.7 to 8.2 mm., but the male collected by Van Duzee is a xanthic form, 10.2 mm. long, with the pale markings on dorsum of thorax enlarged, propodeum entirely pale except enclosure, sides of thorax pale, legs entirely yellow except for a streak beneath on femora, with broader bands on tergites, the first tergite pale on apical half, the seventh almost entirely pale, and the pale marks on the sternites also enlarged, joined by a narrow apical band and present on the second to sixth sternites. The details of punctuation are similar in all paratypes, the ratio of interocular widths at base of clypeus and across posterior ocelli is constant, and the ratio of interocular distance at base of clypeus to length of first two flagellar segments is 7:5.8-6.2.

The female paratypes are 8.7 and 10.2 mm. long; the smaller one agrees with the allotype in coloration, but the larger one has slightly more extensive markings including all of labrum, oblique lateral spots on clypeus and posterolateral spots on fourth sternite. In both paratypes the first and second cubital veins are slightly separated on the radial vein.

***Bembecinus bishoppi*, new species**

(Fig. 5)

The combination of ivory and ferruginous maculations on legs of female serve to distinguish *bishoppi* superficially from all others in this area. In addition, the ratio of interocular distance at base of clypeus to the length of the first two flagellar segments in the male is much greater than in other Nearctic species.

Type: ♂; Midland, Texas; June 6, 1913 (F. C. Bishopp) [U. S. National Museum, Type No. 59353].

Male.—Length 7.7 mm., forewing 4.9 mm. Black, dark markings of antennae and legs brown, pale maculations ivory as follows: Palpi, mandible except tip, labrum, clypeus, supraclypeal area except laterally, narrow band along inner eye margin extending from base of clypeus two-thirds the distance to anterior ocellus, scape, pedicel and first flagellar segment beneath, band along posterior margin of pronotal disk including tubercles, spot on base of tegula, band along lateral margin of scutum extending from apex three-fourths the distance to base, oblique lateral subquadrate spots on scutellum, transverse band on postscutellum, very small spot on upper part of mesopleuron, large spot on posterolateral angles of propodeum, all coxae beneath at apex, fore and mid femora with a stripe beneath, tibiae and tarsi entirely except spots beneath on former and along posterior margins of latter, tergites one to five with apical bands, that on first twice as broad and narrowed slightly in middle on anterior margin, the latter four emarginate anteriorly on each side of midline, sixth tergite with a spot on apical margin at midline, sternites two to four with triangular posterolateral spots diminishing in size posteriorly.

Structural characters of importance are as follows: Interocular distance at base of clypeus much greater than combined lengths of first two flagellar segments (7:5.5), distance between lower margin of antennal socket and base of clypeus twice the distance between the lateral margin of antennal socket and inner eye margin, ratio of interocular distance at base of clypeus to interocular distance across posterior ocelli as 1:2.1, seventh to ninth flagellar segments as long as apical width, the last segment concave beneath, but not tuberculate, posterior surface of propodeum very shallowly concave, the lateral angles not compressed or well-developed, hind tibia incrassate when viewed laterally, hind basitarsus 0.6 the length of hind tibia, second submarginal cell narrowed above, the first and second transverse cubital veins almost meeting on radial vein, sixth sternite with apical margin almost straight, and seventh sternite very densely punctate, not carinate in middle.

Allotype: ♀; same data as type [USNM].

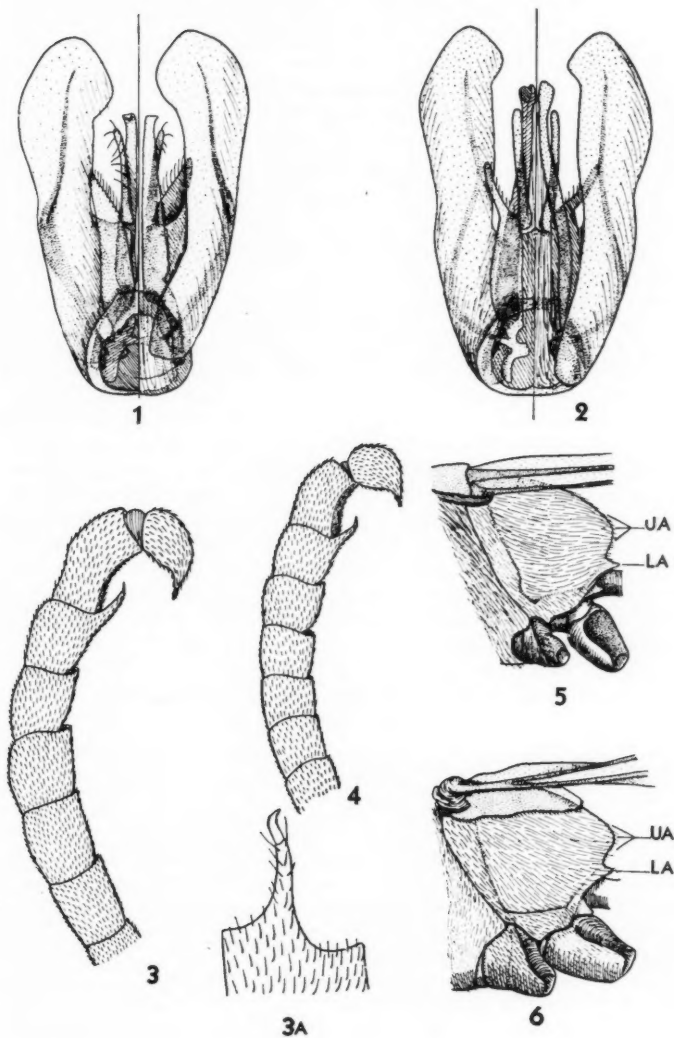
Female.—Length 9.0 mm., forewing 6.1 mm. Coloration similar to male with the following exceptions: Darker markings of hind femur and all tibiae and tarsi ferruginous, flagellum entirely pale beneath, spots on scutellum, postscutellum, propodeum and mesopleuron somewhat larger, sixth tergite not spotted.

Similar in sculpture to male except for the usual sexual differences and the following: Ratio of interocular distance at base of clypeus to first two flagellar segments as 3:2, of the former distance to the interocular distance across posterior ocelli as 1:2.2, first and second transverse cubital veins meeting on radial vein.

Paratypes: 10 ♀♀; same data as type [USNM]. 2 ♂♂; Round Rock, Williamson Co., Texas; May 30, 1935 (J. E. Gillaspay; on *Stillingia sylvatica*) [R. W. Strandtmann Coll.]. 1 ♀; Austin, Texas; June 3, 1929 (J. O. Martin) [California Academy of Sciences]. Paratypes have been placed also in the collections of the Museum of Comparative Zoology, British Museum (Natural History), Cornell University and the Universidad Nacional de Tucuman.

The female paratypes vary in length from 7.5 to 9.2 mm. In the smallest the pale markings are only slightly more extensive than in the male holotype, while in the larger ones they are noticeably larger. This condition leads us to suppose that males may occur in an extreme xanthic form such as do *godmani*, *neglectus* and *wheeleri*. However, the two male paratypes are very similar in coloration to the holotype, lacking only the median spot on the sixth tergite, but are decidedly larger (9.7 mm. long). In one male paratype the ratio of interocular distance at base of clypeus to length of first two flagellar segments is 7:5.

Figs. 1-6.—1. Male genitalia of *Bembecinus g. godmani* (Cam.) from Mesilla, N. Mex., ventral view at left, dorsal view at right; 2. Male genitalia of *B. n. nanus* (Handl.) from Arlington, Va., ventral view at left, dorsal view at right; 3. Lateral view of apex of male antenna of *B. neglectus* (Cr.) from Cypress Mills, Tex.; a, ventral view of apex of eleventh antennal segment showing spine and apical seta; 4. Lateral view of apex of male antenna of *B. g. godmani* (Cam.) from Mesilla, N. Mex.; 5. Lateral view of female propodeum of *B. bishoppi*, n. sp., paratype; UA—upper angle, LA—lower angle; 6. Lateral view of female propodeum of *B. n. nanus* (Handl.) from Oglethorpe, Ga. (Drawings by Miss Addie M. Egbert, Bureau of Entomology and Plant Quarantine.)



A Boy Attacked by a Shark, July 25, 1936 in Buzzard's Bay, Massachusetts

With Notes on Attacks by Another Shark
along the New Jersey Coast in 1916

E. W. Gudger

American Museum of Natural History, New York City

Southern New England newspapers of July 26 and 27, 1936, chronicled what purported to be an attack on a boy by a shark in Buzzard's Bay, Massachusetts, at a point just north of Mattapoisett Harbor. The attack being apparently authentic, I wrote Dr. Hugh M. Smith at Woods Hole nearby, urging that he investigate the alleged attack and get the exact facts. He answered that he was collecting all data and that everything indicated the authenticity of the attack.

After the close of the season (1936) at Woods Hole, and on his way back to Washington, Dr. Smith visited me in New York and left with me an envelope containing the data he had collected. And his final words were, "I leave the whole thing in your hands. I am too busy to do anything more. In any case, you will be able surely to establish the fact of the shark's attack and the boy's death."

It is a matter of great regret to the writer that the pressure of other work has so long delayed the preparation of this report, the only account of an attack by a shark on a human being on the New England Coast, and that in the meantime Dr. Smith has died.

THE SHARK ATTACK AT HOLLYWOOD BEACH, BUZZARD'S BAY, MASS., JULY 25, 1936

The attack under study occurred off Hollywood Beach, just above Mattapoisett Harbor, Buzzard's Bay, Massachusetts, between 3 and 4 p.m. on July 25, 1936. Joseph Troy, Jr., 16 years old, of Dorchester, Mass., was swimming about 150 yards off shore, in water 10 or 15 ft. deep, along with an older man, Walter W. Stiles, of Boston, Mass. The two were about 10 ft. apart. Stiles was swimming quietly using the side stroke, but Troy, using a "crawl" stroke, was making considerable commotion in the water. Suddenly and without warning, a shark coming from under water appeared at Troy's left side (the side away from Stiles) and, turning somewhat belly up, laid hold of the lad's left leg and carried him under water before he could make any outcry. However, the momentum carried both shark and lad closer to Stiles.

Stiles recognized the attacking creature to be a shark and recalled that it probably had a mate not far away—since sharks are commonly believed to go

in pairs. Yet he had but one thought—to help his friend. So with superb courage he trod water while Troy fought the shark (as evidenced by the lacerations of his hands) and quickly broke away from it and came to the surface. Stiles then swam to his friend, caught and supported him with one hand and paddled with the other while shouting for help.

The shouts were heard by Mr. and Mrs. Herbert Fisher, of Dorchester Center, Mass., who were mooring their boat after a sail in the Bay. Mr. Fisher jumped into a dory and rapidly rowed to where Stiles was supporting the wounded boy. Fisher and Stiles, with much difficulty, got Troy into the boat, and then Stiles, much exhausted, was helped to clamber aboard. In the meantime, the shark was standing off and on in the blood-reddened water but a few yards away, seemingly ready to make another attack—and why it did not is inexplicable.

While the rescue was being made, a telephone call had been put in for a doctor at Mattapoisett. During the waiting for him, the mangled boy was laid on a door to maintain his body in as normal and as easy a position as possible. The late Dr. Irving N. Tilden of Mattapoisett came quickly, supposing the call was a case of drowning.

He found the wounded boy conscious in spite of the fearful lacerations from the bite, but in a severe state of shock—no radial pulse could be felt. The lad was at once put in a motor car and carried as quickly as possible to St. Luke's Hospital in New Bedford, 11 miles away. There it was at once seen that amputation was imperative, but because of the lad's condition, this was delayed until intravenous saline and glucose injections could be made. The amputation, performed by Dr. Edwin D. Gardner, now living in Marion, Mass., was done just above the bitten part of the thigh and the wound was being sutured when the boy rapidly grew worse and, in spite of all efforts to save him, died about 8:30 p.m., some five hours after the attack.

As to the injuries sustained by the lad (Troy), it seems best to quote, rather than transliterate, Dr. Tilden's report to Dr. Smith. He writes that the following injuries were found:

On the right upper chest and the right shoulder were areas of discoloration [due presumably to a rasping stroke of the shark's denticled hide] but the skin was not broken. The terminal phalanx of the left middle finger was practically amputated just distal to the terminal articulation. There were several superficial lacerations of the middle finger and also of the terminal phalanx of the left index finger. There were multiple lacerations of the right index and ring fingers.

On the dorsum of the left thigh, extending from the fold of the buttock downward for a distance of eight inches, there was a loss of tissue which included skin, subcutaneous fat, fascia, muscles, blood vessels and sciatic nerve, in places down to the femur. This loss of tissue, although not as deep as posteriorly [sic], extended forward on either side of the thigh, becoming more superficial anteriorly so that a strip of skin no more than two and a half inches wide on the anterior surface of the thigh was left intact. External to this strip of intact skin, the skin itself was torn in shreds. The femoral vessels were left intact at about a distance of half an inch from the injured muscles. There was only a moderate amount of bleeding from this wound. The skin edges were serrated as if cut off by a toothed object. The femur was not fractured. The circulation of the leg and foot below the injury seemed all right, although the foot was somewhat pale and cold.

The identity of the shark that made the attack is of very great interest. It seems surely to have been a "man-eater," a *Carcharodon carcharias*. Here is the evidence. Stiles saw the shark attack Troy and writes that it "exposed its belly very clearly, that this was very white and the transition of this to the very dark color of the sides was quite sudden or sharp." This is true of the two mounted "man-eaters" in the American Museum. Furthermore, the white in our specimens extends much farther up on the sides than in any of our other mounted sharks (Fig. 1). This unusual amount of white on the sides is probably the reason why this shark is also called "the great white shark." Further, Stiles writes that "the tail had two long sharp flukes" and that the upper one seemed slightly longer than the lower. In our best specimen (Fig. 1) the pointed flukes of the lunate caudal fin are nearly equal in length—the front edge of the dorsal lobe measuring 27 in., that of the ventral lobe 23.5 in. The rear edge of the dorsal lobe has near the top a slight notch making it seem longer—as may be seen in Fig. 1.

One other bit of evidence is worthy of presentation. Dr. Tilden, in reporting various effects of the shark-bite, says—"The skin edges of the wound were serrated as if cut off by a toothed object." Just here it seems well to insert the photograph of a *Carcharodon* tooth (Fig. 2) that the reader may see how accurate is Dr. Tilden's statement.

On the matter of the identity of the shark, Dr. Smith writes that: "From all the circumstances in this case, it clearly appears that the offending shark was a man-eater (*Carcharodon carcharias*), estimated to be 10 to 12 feet long by the two men, Stiles and Fisher, who saw it and have written out their accounts and sent them to me."

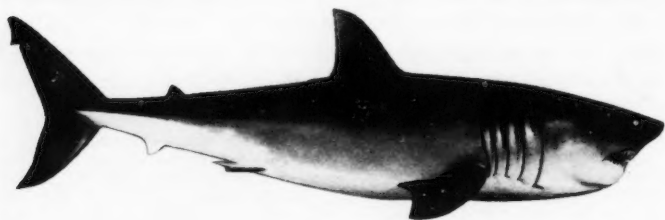


Fig. 1.—A 10-ft., 7-in., 998-lb. *Carcharodon carcharias* taken off Brielle, N. J., in 1933. The spread of the lunate caudal fin is 35 in. The length of the upper lobe measured along the front edge is 27 in.; of the lower lobe 23.5 in. Note the large amount of white on the side—"great white shark." From a photograph of the model in the American Museum made from a cast of the recently dead fish.

From the fact that this is the only account of an attack by a man-eater shark on a human being in New England waters, the reader has probably already come to the conclusion that this kind of shark is very scarce in these

parts. But not so. Dr. Smith, with characteristic thoroughness, compiled a list of 20 definite records of *Carcharodon* in and near Buzzard's Bay from 1871 to 1927, and at the end he notes that "This list is by no means complete."



Fig. 2.—The triangular serrate tooth of a *Carcharodon carcharias*. Natural size not known. Photograph A.M.N.H.

Now as to details: Specifically, two individuals are recorded as caught on the same day, the others were seen or caught on separate days in the years noted. In size these measured individual sharks ranged from 4 ft. to 12 ft., 6 in. in length. Indicative of their relative frequency and abundance, it is noted that "specimens" were taken in Buzzard's Bay on 6 days in June, 1903: 7, 9, 20, 23, 25, 27. The largest white sharks recorded were seen by Vinal Edwards (the veteran collector and recorded of the U. S. Fish Commission Laboratory for many years). Dr. Smith states that "He reports several 18 to 20 ft. long seen in the summer of 1905 off Gay Head."

The years with reported occurrences are 1871, 1873, 1898, 1903, 1905, 1906, 1907, 1910, 1911, 1916, 1923, 1924, 1927. It should be noted that the records, beginning with 1903, are frequent—nearly all being by Vinal Edwards, who was particularly on the lookout for sharks.

From these invaluable data, it is clear that *Carcharodon carcharias* can not be put down as of very unusual occurrence along the southern shore of Massachusetts, and specifically in the Buzzard's Bay region. However, these numbers for these summer months of some years must not be overemphasized. This great shark is a native of tropical, subtropical and warm temperate waters. It is merely a summer migrant in the Woods Hole region, having drifted there in and with the Gulf Stream, and it is notable that in the assembled data from 1871-1923 (52 years) there is no record of a shark attack—and, indeed, none until 1936 (65 years). So it may truly be said that the chance of being bitten by a shark in these waters is about on all fours with the chance of being struck by lightning in these same regions.

This concludes the account of the only known case of a shark attack on a human being in New England waters. The account is based wholly on the data collected and so painstakingly set down by Dr. Hugh M. Smith. It is a source of keen regret to the present writer that the working up of the data was not done prior to Dr. Smith's death in 1941. Could the manuscript have had the benefit of his revision and emendations, it would surely have been put in better form. But the essential facts are here—thanks to him.

The late Herman Oelrichs had, for many years in the late 1800's a stand-

ing offer of \$500 for an authentic account of a shark attack on a human being north of Cape Hatteras. But the reward was never claimed and lapsed at his death somewhere about the turn of the century. From the avidity with which newspapers and public "take to" shark stories, and particularly to shark attacks on human beings, the fact that no claims were made for the award evidently means no attacks occurred.

In conclusion, it seems not inappropriate to end this paper with a brief resume of the only other shark attacks known from the Western North Atlantic.

SHARK ATTACKS ON MEN AND BOYS IN NORTHERN NEW JERSEY WATERS IN 1916

In 1916 a "mad shark" (not inappropriately so designated by the newspapers) ranged along the northern New Jersey coast and a number of persons were killed. So many were the alleged attacks and so great was the fear engendered, that Dr. R. C. Murphy of the Brooklyn Museum and Mr. J. T. Nichols of the American Museum joined up to make a thorough survey of the "Shark Situation in the Waters about New York"—as the title of their report reads. Here follows a resume of their studies on *Carcharodon* as published in *The Brooklyn Museum Quarterly* (1916, vol. III, pp. 143-160).

So far as these authors could ascertain, the first of the New Jersey attacks occurred on July 2, 1916, at Beach Haven. This resulted in a fatality, but no details were ascertained. On July 6, another attack and another fatality occurred at Spring Lake (near Sea Girt), 20 miles further north. But again no details came to hand. And lastly, on July 12, a multiple attack occurred about 20 miles still further north in Matawan Creek, just inside Sandy Hook.

Some boys were in bathing. One was killed outright. A man, who tried to help this boy, was attacked in shallow water, and the skin and muscles of his thigh were badly torn, and the artery was probably cut, for he died shortly after. Further down the Creek, a boy's leg was so badly bitten as to call for amputation. All this in one afternoon and presumably by one and the same shark.

These attacks stirred the public as few things have and scores of shark-hunting boats patrolled the coast, the bays, the inlets and the rivers of northern New Jersey. It was called a "shark season" because scores of sharks of various kinds were seen and caught. These are thought to have come inshore seeking food consequent on a marked absence of menhaden and other fishes that go in schools and hence are easy prey for sharks. All the sharks taken by the patrols were "man-eaters" to the public, but, with one exception, not to ichthyologists. Fortunately, Mr. Nichols clipped and preserved all the shark stories from the newspapers and for them the following account is abstracted.

On July 14, 1916, Mr. Michael Schleisser of 29 East 132 St., New York, took a shark off South Amboy, New Jersey, in a drift net dragging behind his boat. The 8½-ft. shark required a lot of killing, but it was finally

subdued, brought in to South Amboy and dissected. In its stomach was found a lot of flesh and bones—weighing about 15 lbs. The large bones and the shark were brought in to New York. The bones found in the stomach were sent to Dr. F. A. Lucas, then Director of the American Museum, and were identified by him as human bones.

Mr. Schleisser, who had had some training as a taxidermist, mounted the skin and placed it on exhibit at the "Home News" office at 135 East 128 St. Mr. Nichols went there to see the mounted skin, and positively identified the fish as the great white shark, or man-eater, *Carcharodon carcharias*.

And as a postscript to the above, the following bit of personal testimony may be added. In 1917 or 1918, I saw in a fish shop on Broadway, near 86 St., New York City, the jaws of a shark labelled: "The Jaws of the New Jersey Man-Eater." I examined these jaws and noted the characteristic broadly triangular saw-edged teeth, which showed that these jaws came from a *Carcharodon carcharias*—and presumably from the New Jersey shark of 1916.

After the capture of this shark, no other shark attacks occurred in New Jersey waters and Murphy and Nichols came to the conclusion that Mr. Schleisser's shark was a solitary one and the sole attacker of the men and boys killed. And so the matter stood for 20 years until the attack described in the first part of this article brought another death to the record of shark fatalities in the Western North Atlantic.

From the evidence set forth in this article, plus the accounts in the literature, it seems that *Carcharodon carcharias* is not inappropriately referred to as a man-eater.

Notes on the Behavior of Horned Toads

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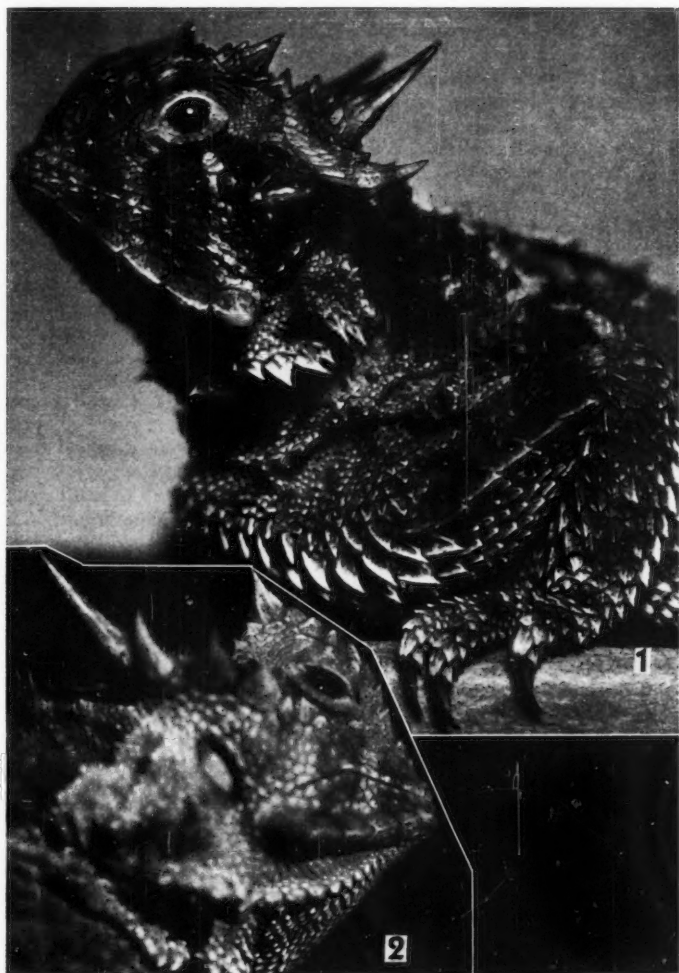
Slightly more than 13 years ago, the senior author had the good fortune to witness the mating of the Texan horned toad, *Phrynosoma cornutum* Harlan. His sudden realization of the use of the temporal horns on the female's head as a mouthbite for the clasping male, led to publication of a second note on the subject (67). During the past summer, both authors have had opportunity to extend previous acquaintance with this interesting animal, and with its western, short-horned relative, *P. douglasii* (Bell). The latter was represented by specimens from both east central New Mexico—apparently subspecies *P. d. ornaticissimum* (Girard)—and from ponderosa pine woods in northern Arizona—apparently subspecies *P. d. hernandesi* (Girard). These identifications correspond to information given by Smith (92) and Dodge (30), although the subspecies "at present . . . are best identified . . . by locality" (Smith, loc. cit., p. 289 ftn.). *Phrynosoma cornutum* and *douglasii* differ greatly in behavior. Each has been observed at length both in the field and in captivity over a period of at least four months.

The present paper draws together the scattered literature (other than taxonomic or distribution) and relates it to our own notes on these lizards. In preparing the manuscript we have benefited from correspondence with Dr. Hobart M. Smith of the University of Illinois, by an opportunity to check our bibliography against his card files, and through permission to include some of his observations to round out our account. We are most grateful for this friendly assistance.

FOOD AND ENEMIES

Horned toads obtain their prey entirely by visual clues, and their eyes have been found to be well developed for daytime seeing and high visual acuity (12, 22, 26, 51, 66). They pay no attention to any stationary object. Movement seems to be far more important than any other feature of prospective prey; thus Weese (105, 106) records *P. modestum* ingesting lead shot rolling down an incline, and sand grains in a light wind. Possibly this is the explanation of vegetable debris and "considerable" sand found (64) in the gut of *P. cornutum*.

A creeping grasshopper or running ant excites both *P. cornutum* and *P. douglasii* to slow, rather jerky, following movements, and a very amusing lateral twitching of the spiny tail like that of a cat watching a bird. This habit as part of feeding behavior was mentioned by Edwards (31), and the same gesture has been observed in males evidencing interest in a female (31) or when merely irritated (111). Even newborn *P. d. hernandesi* show this behavior when potential food appears.



Figs. 1, 2.—1. Visual clues lead horned toads to their moving prey. The eyes are well developed and habits would suggest binocular use with some degree of depth perception. *P. cornutum* often raises its body by extending the fore limbs, and obtains a good view of the surrounding soil from the elevated position; 2. The ear is well developed in *Phrynosoma*, though hidden in the fold of scaly skin behind the horns. There is no evidence available to show that hearing plays a part in the behavior of these lizards.

Ants form the largest single item in the natural diet of horned toads, as was pointed out by early observers (78, 84). In captivity they will accept almost any insect (1, 31, 115)—even earthworms (105) although Ditmars claims that this prey was never taken (28). The field observations of Winton (109, 110, 111) have been extended greatly by the stomach-content studies of Knowlton and his co-workers (53, 54, 55, 56, 57, 59, 60). The latter indicate what food horned toads take in the open fields of their native habitat, where ants overwhelmingly outnumber the various other insects and spiders caught. Davis (23) made an interesting comparison by freeing and later recapturing a *P. cornutum* on a Michigan beach, where the animal thrived on grasshoppers, weevils and true bugs, with only 10% of the stomach contents composed of ant remains. The work of Knowlton referred to lists caterpillars, grasshopper nymphs and even large adults, histerid beetles, leafhoppers, mutillid wasps, neuropterans, pentatomid bugs, pipunculid flies, predaceous hemipterans, weevils and wild bees. To this can be added snails (110).

We have observed both *P. cornutum* and *P. douglassii* employing the feeding tactics as outlined by Weese (105, 106). Since large food is taken regularly from its advancing end, the lizards always watched earthworms and caterpillars many seconds before making any attempt to grasp them. During this examination, the horned toad ordinarily stood close to the prospective prey, often with the head cocked on one side. Then the lizard would bend forward, flick the tongue and snap with the jaws. If the first trial did not take the food well into the mouth, the horned toad rejected it and tried again. If, however, large food was grasped well and the mouth could not close over it, the animal swung the head rapidly from side to side, pressed the lower jaw against the ground, and backed up to keep the worm or grasshopper stretched out and pointing toward the apex of the angular mouth. Some of these demonstrations in *P. d. hernandesi* forcibly suggested a dog shaking a rat. Perhaps there is some correlation between this habit and a normally larger food morsel, since tenebrionid beetles have been cited as a major part of the diet of this subspecies (33).

P. douglassii at least, may be charged with occasional cannibalism (30). We have noted *d. hernandesi* eating young of its own species, but believe that on each occasion the recently born young were not behaving normally—possibly due to lack of proper food. Under ordinary circumstances, the lizardlets are like their elders in either standing perfectly still, or scampering at fair speed. In these states they seem perfectly safe from attack by larger horned toads. But a sick youngster creeps slowly and continually for significant periods, and during such abnormal activity, these individuals were picked up regularly by the adults. When water is so scarce in the arid areas where horned toads live, cannibalism becomes an effective aid to survival. Natural selection seldom provides for the infirm—hearsay such as Lockwood's (62, 63) notwithstanding.

Dr. Hobart Smith suggests (*i. litt.*) that the red agricultural ant (*Pogonomyrmex*) has been preyed upon so long by *P. cornutum* and others that it has

developed a protective perception to the presence of horned toads. He records that on June 26, 1946, he placed a wire cage with about eight *P. cornutum* adults on an active ant nest at 6:00 P. M. By 7:00 P. M. all ants had disappeared. Ants were still active on another hill, and the cage was then transferred to the busy site. The ants disappeared promptly — not through the action of the horned toads. The next day the cage was left all day on one hill known to be active normally; no ants emerged. At night (10:00 P. M.) of June 28, he placed the cage on a very active hill, and in 15 minutes not over a dozen ants remained. Changed to another hill (and although the ants bit the lizards viciously), they were disappearing in half an hour. These results are certainly suggestive. *P. cornutum* commonly catches this ant by waiting beside frequented ant trails, not by direct approach to the nest itself.

Insects crawling on the back of a horned toad, particularly on its head, cause the lizard to close eyes and nostrils and appear to feign sleep. Even a hungry horned toad will behave in this way. If an ant or grasshopper rests for long on one side of the head or in the region of the ears, *P. cornutum* will slowly stand up, then reach forward with the hind foot of that side and kick the insect away. The lizard may continue with the foot to scratch the area as though it itched. *P. d. hernandesi* removed youngsters from the maternal head, using the same procedure. Youngsters resting on her back, however, were not dislodged. Since both young and adults commonly climb on eminences to peer into the vicinity, and since the young seem to remain with the parent for at least a day or so after a viviparous birth, such behavior may be observed rather easily.

On the other hand, when biting ants such as *Pogonomyrmex* — the important dietary article with *P. cornutum* and other species — attack the motionless body of a free horned toad, the lizard is stirred into violent motion. It scrambles through leaf litter, shaking head and shoulders to dislodge the ants. If these efforts are unsuccessful, the horned toad buries itself in loose soil and scrapes the attackers away. It is curious that the seemingly armored back of the horned toad should be so sensitive to ant bites when the digestive tract is apparently immune to their jaws and to the stings of bees and wasps. Yet *P. cornutum* caged on an ant hill has been killed by ant attack (61).

Occasional individuals are found that are ready to defend themselves against much larger animals. We confirmed this observation on *P. d. hernandesi* on the Kaibab Plateau where Dodge made the original notes (30). Even some youngsters less than two inches long would jump at a finger with mouth wide open, hissing. Dr. Hobart Smith (*in litt.*) found one Texan *P. cornutum* maintaining such a disposition for several days. When approached, the lizard elevated its body, flattened it out, and stood up a little on the front legs, very high on the hind legs; the tail dragged. Often the whole body was tilted in the direction of the danger, to bring the full area into view. This flattening produced a sub-circular shape, with the belly protruding forward beyond the neck, so that the head seemed to originate within the periphery of the body. When a foreign object was poked toward the animal

from any direction, the lizard jumped around promptly to face the attack. If the object advanced, the lizard would leap short distances and rock back and forth, nipping as it jumped. "It was not bluff, for the lizard once caught a finger and had to be pried off." We have a 16 mm motion picture record of a very juvenile *P. d. hernandesi* reacting in much the same way. Another, an adult, became pugnacious a few days before giving birth to her litter of young. Afterwards, she returned to relative docility.

We noted an apparent difference between *P. cornutum* and *P. douglassii* both on the ground and in their reactions to handling. The long-horned *P. cornutum* spends much of its time resting on pelvic areas, hind legs and tail, with the head and shoulders held high by the almost straight fore legs. In this position the animal keeps alert watch on its surroundings, and is ready on a moment's notice to elevate the hinder region of the body and scamper with the speed of a mouse to some new locality. Its activity may be the reason for the far greater number of specimens of *P. cornutum* seen running across highways, or crushed there by passing cars and trucks. *P. douglassii*, on the other hand, may be more critical of the soil type of its substratum. The animal rests the greater part of the belly surface on the ground, and when excited enough to stand up, it employs all four legs to raise the venter clear. *P. cornutum* commonly puffs its body full of air when frightened or handled, but under normal circumstances retains the deflated form, with sides drooping and wrinkled, and scaly fringes not conspicuous. *P. douglassii* usually keeps the body spread, its lateral fringes in evidence. Thus the short-horned species, even when starved, presents a flat, bulky, stodgy appearance. The long-horned form, when fully fed, seems lank and much more alert.

Several authors have commented on the lack of interest shown by horned toads for water (8, 18, 20, 31, 37, 69, 77, 85, 105, 106, 110, 110, 111, 115). A few have suggested that dew may supplement the water content of the insect diet, but no observations are offered in confirmation. Dodge (30) reports thirsty *P. d. hernandesi* "drinking greedily." We have forced captive *Phrynosoma* (both *d. hernandesi* and *cornutum*) into water and sometimes scrubbed them clean of fecal material in suds. On no occasion has a horned toad been observed to drink voluntarily until warm water seeped between its closed jaws. Since the lizards float high, this is easiest to achieve by tilting the dish containing them until the water rises to nostril height. Most will then begin to open the mouth, extrude the tongue a little, and show definite swallowing movements at the sides of the throat. Later the water can be identified by palpation of the abdominal area.

Anatomical and physiological studies show cause for the ability of the horned toad to thrive where little water is available. The rectum is very distinct from the colon, and well developed for water salvage from fecal matter (64). The nitrogenous wastes are eliminated in the form of uric acid (106) — the most economical procedure for water retention. The lizards are very sensitive to currents of particularly dry air (105, 106), and attempt to escape from losing water to it by burrowing in the soil. Apparently this

reaction is independent of response to heat as such. The present authors have observed that a live steam jet in the same cool room with hibernating *P. cornutum* excites them to great and sudden activity while dry heat for corresponding periods has little effect.

Ability to do without food and even without much ventilation for months or even years has been credited to the horned toad. Potter and Glass studied these points (75, 76, 77) to evaluate newspaper stories of these lizards incarcerated in various ways for great lengths of time. They report a horned toad kept without food and water and with only one feeding that died in less than a year. The supposed correlation with food and water may not be the true explanation, since with the best possible care, 20 months seems to be the longest recorded life of an adult in captivity (65). The other experiments are more clear cut. Carbon dioxide accumulating to 12% or 15% as the result of respiration was fatal to lizards in closed liter containers before they had reached their critical lower limit of 3.2% oxygen (75). The time required to reach these gas concentrations varied, as would be expected, with activity and hence with temperature. The respiratory quotient is approximately the same whether the animal is active or hibernating, although the oxygen consumption may drop from a normal of 135 cc. per kilogram of animal per hour to a mere 7 cc. (76). Only entry into hibernation produces shock adequate to cause carbon dioxide retention and a temporary decrease in the R.Q.

Captive horned toads maintained at temperatures near their optimal range, discharge numbers of nematode worms along with fecal material. These and other internal parasites have received attention by several authorities (41, 47, 68, 71, 82). Figures for the abundance of roundworms are given by various workers who have made statistical studies on gut contents (53, 54, 55, 56, 57, 59, 60, 61). Prevalence of these parasites is usual in animals whose diet consists chiefly of insects.

Little is known of the larger enemies of *Phrynosoma*. Along the Mexican border where the roadrunner is common, many horned toads are added to the snakes and other lizards eaten by this active predator. Swainson's hawk has been found to prey on *P. d. ornatissimum* (58). Possibly some of the desert rodents are even more effective, although no instances have been recorded. Captive horned toads have been killed by mice, particularly when the lizards were too cold to resist attack (6). That they will offer resistance, when warm enough to be active, was observed by Dr. Hobart Smith who observed a captive specimen of *P. d. ornatissimum* to open its mouth and hiss frequently, and by continually facing a mouse to ward off attack (*i. litt.*). Most cats and dogs show no interest in horned toads.

The relationship between the short-horned species of *Phrynosoma* and snakes is unknown. *P. cornutum* is attacked occasionally by rattlesnakes, with fatal results for both participants. The lizard bends its head downward and presses the temporal spines through the roof of the snake's mouth or throat, so that the horned toad can neither be swallowed nor freed. Inter-

locking skeletons, cleaned thoroughly by ants, are not uncommon in the desert areas of northern and western Texas.

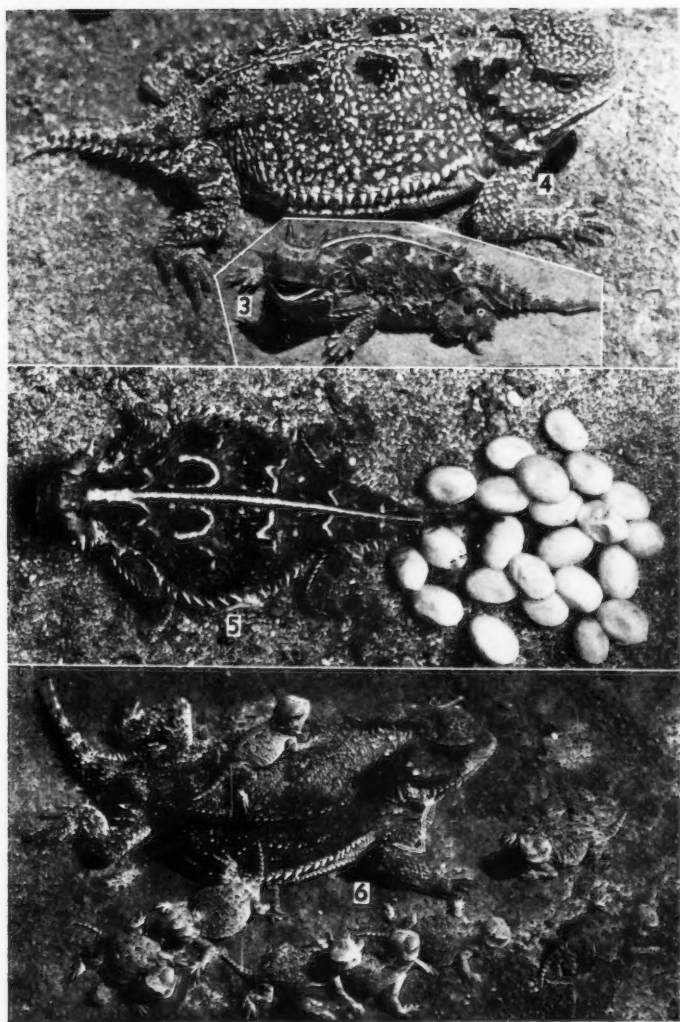
Children take such interest in horned toads that the docile lizards almost become pets in the western states. Possibly this is the basis for the commercial availability of the Texan *P. cornutum*, and for the number of places where this species has been reported as escaped and apparently beginning new colonies (2, 11, 14, 25, 27, 38, 39). Certainly the maintenance of specimens in captivity has provided much information on the life history aspects and physiological processes involved. *P. cornutum* is by far the most completely studied North American lizard (92).

THERMAL REQUIREMENTS

The several species of *Phrynosoma* have such differences in their geographical and vertical distributions (92) that a variety of thermal requirements would be expected. Thus *P. d. hernandesi* is associated commonly with high altitude (13, 50, 52, 84, 98) and would be less often exposed to elevated temperatures than, for example, *P. cornutum*. In comparing the behavior of these two, it has been our observation that *P. cornutum* gapes and breathes deeply and slowly when placed in the hot sun; *P. d. hernandesi* keeps its mouth closed, but respiratory movements become rapid and violent. The thermal death point is reached in *P. d. hernandesi* at least 5°C. below that for *P. cornutum*. Perhaps the open-mouthed panting is significant, although it must represent evaporative cooling through loss of water and hence be a risky procedure for an animal living in arid areas.

Experimental studies on *P. platyrhinos* (18) indicates that 37° to 38°C. is an optimum temperature, voluntarily selected by the lizard. Yet only 3° above this range, the horned toads display considerable discomfort, and short exposure to 45°C. brings death. Apparently the presence of *Phrynosoma* in the desert and semi-desert regions of North America is correlated with a physiological need for 37°C. as an optimum working temperature, below which peristalsis and other functions do not operate well. Only in their present habitats (and the few where escaped *P. cornutum* appear thriving in the south-east) can such temperatures be counted on for any considerable portion of the year. Reliance is placed upon ability to escape fatal heat by retreating to cooler levels in the earth, and, under extreme conditions, by respiratory (evaporative) cooling.

Color change has been recognized in *Phrynosoma* at least since 1899 (40). More recently it has been suggested (20) that such alterations in coloration may be a mechanism to provide an extension of time for activities at marginal thermal levels, rather than an aspect of protective coloration. This is compatible with the findings of Redfield (79, 80) and Parker (74). It is an added use for a melanophore mechanism already recognized to be complex. Further, it would show a basis for the seeming contradiction found by Parker (*loc. cit.*), in which the darkening of pigmented areas was brought about both



Figs. 3-6.—3. When exposed to intense sunlight for an appreciable time, *P. cornutum* often opens its mouth and appears to pant. Food thrust into the mouth at this time is swallowed, but if free to change its position, the lizard seeks a shady spot and resumes normal breathing. Water loss in panting must be significant and constitute an emergency sacrifice for such a desert animal; 4. Although *P. d. ornaticissimum* may be rather strikingly colored with ashy gray fringe and speckling, bright yellow dorsal blotches alternating with chocolate brown maculation, the lizard matches the soil colors so that camouflage is effective; 5. *P. cornutum* with 23 eggs laid in a single night. Afterwards, the parent weighed 15.3 grams, the eggs 23.1 grams; 6. *P. d. bernandesi* with a small litter of 8 young born at night. Another litter born to a second female totalled 21.3 grams (21 lizardlets); after the birth, the parent weighed 18.5 grams.

by strong light (which would involve radiant heat) and by low temperatures, while decided blanching was due to darkness or to high temperatures. It seems entirely possible that a better explanation for dark-colored horned toads on lava outcroppings (such as the extensive *malpais* near Grants, New Mexico) or dark soils (such as below pine litter in the Kaibab forest of northern Arizona), may be that in such sites retirement to cool safety is easier than on light dry soils. In few other natural situations can one step from broiling sun on uncomfortably hot rock, to a temperature near or below freezing (like that of the "ice caves" of the *malpais*), without leaving the light of day or moving more than twenty feet. And these lizards appear to have few enemies that camouflage would help in evading.

Horned toads employ another means of maintaining body temperatures above those of their surroundings, while remaining active in the open. Weese (105) and Smith (92 p. 318) have described the lizards as extending the legs of one side of the body in such a way as to tilt it and retain nearly normal incidence of sunlight on the back. By this means the maximum heating effect of slanting rays is obtained, and body temperatures may be kept at adequately high levels during hours after sunrise and toward sunset when the lizards would otherwise be inactivated by the cooling air.

Escape from high (and low) temperatures may be achieved by entering rock crevices or the burrows of other animals, or by creeping below insulating materials. Edwards (31) described active burrowing in *P. cornutum*, both by a deliberate removal of earth with the fore feet, assisted by the hind in pushing earth from the hole, or by wriggling movements by which the body is worked into the soil. We have observed the latter behavior on several occasions. The head is used as combined shovel and bulldozer blade, with vigorous nodding and twisting movements of the hard skull while the feet press the animal into an initially small hole. When a trench has been constructed almost as long as the lizard's body, it works the four feet and also the scale fringes on the body margins to sink itself further. Apparently the ability to inflate and deflate these lateral extensions of the trunk is quite important in self-burial procedure. Parker (74) gives a photograph of a horned toad so buried, with only its head exposed. No corresponding activity has been noted in *P. douglassii*, although loose soil has been mentioned as a requirement for the distribution of this species (84, 104, 106). Our notes would indicate that *P. d. hernandesi*, at least, runs over a more sod-like earth with roots and debris making the habitat far less suitable for burrowing than the drier looser soils of the desert where *P. cornutum* is common. Weese considered this point at some length (106).

Overwintering and reduced activities during cold snaps have interested several authors. Thus Winton, speaking for *P. cornutum* in the vicinity of Fort Worth, Texas, found no evidence of overnight burrowing, or in rainy weather or brief cold snaps (111). His dates for activity extend the horned toad's year from mid-April to the first of October. Givler (37) reported that the males emerged first in the spring. Winton (110) noticed two distinct sizes. Neither of these generalizations was apparent to the senior author in

the vicinity of Austin, Texas. In this latter locality, *P. cornutum* specimens of both sexes were picked up and brought in by students on warm sunny days even in February and March, and occasional individuals were seen on warm afternoons after the middle of October. The Austin experience indicates that the horned toads buried themselves for December and January, and they were found at a depth of six to twelve inches at that time. Since these last notes are based on a single winter's observation, and Austin is some distance south of Fort Worth, a combination of particular season and of warmer locality may make the data more comparable than appears at first glance.

Cowles found (18) that while *P. platyrhinos* submitted freely to temperatures of 28°C., drop of another degree forced them to take refuge underground, although locomotion was not impaired seriously above 18°C. He also recorded *P. m'callii* hibernating a foot below the surface (19). Similar notes by Ruthven (84, 86) and Weese (105, 106) on *P. modestum* yield no obvious common denominator.

Consideration of these thermal requirements suggests that many of the horned toads that die in captivity in spite of seemingly adequate and varied supplies of insect food, do so as a result of "chilly" surroundings such as are comfortable for human beings. When furnished with temperatures of 37° to 38° (about 100°F) — particularly when the humidity is between 20% and 50% — they thrive and demonstrate remarkable alertness and activity. The source of heat need not be sunlight as has been suggested (29), although enough light must be available for these diurnal animals to see their prospective food, and to keep the food moving. An electric hot plate turned on very low, or, better still, a jet of live steam near the cage, is quite as efficient. Unless such provisions are made, the horned toads become sluggish and defecation ceases — a fair indication that physiological processes are not continuing at reasonable levels.

REPRODUCTIVE HABITS

At the present time the argument about whether *Phrynosoma* lays eggs or bears living young (9, 28, 32, 35, 81, 90) seems to have resolved itself. Egg laying has been recorded for *P. cornutum* (9, 31, 32, 50, 81, 96, 106, 112), and for *P. solare* (87).

Abortive eggs, without shell, were noted for *P. modestum* (106), suggesting that it is ovoviviparous like *P. douglassii* (33, 72, 73, 88, 89, 91, 94, 99, 102, 104). Mating has been described only in *P. blainvillii* (113) in which the male gripped his mate on the left side of the neck and then turned her over on her back, and in *P. cornutum* (43, 67), in which the male uses the left temporal horn of his mate as a mouthbite but does not turn her on her back. Givler (37) believed that since the males of *P. cornutum* emerged first from hibernation, each female was inseminated as soon as she appeared. He cites May as the time for egg laying. This does not correspond with copulation dates observed in this species — June 2 (43) and after (67), July 5 and 7 (31), though disagreement is less with the dates of egg laying given

variously as May 30 (9), unlaid in June (16), laid June 7-8 (81), June 25 (31), July 7 (106). Possibly Strecker takes the more correct, broader, view by indicating (96) the whole period from mid-April to late July as the breeding season. The best descriptions of egg-laying in *P. cornutum* are by Cahn (9), Edwards (31), Hewatt (43) and Winton (106). Schonberger (87) gives a clear account of a captive *P. solare* rolling each of 28 eggs in dry surface sand, then burying them in rows — all handling done by the body (chiefly the anal region), none by the limbs.

According to Givler's investigations (37), the ovaries produce about 32 eggs at a time but no clutch for *P. cornutum* has been recorded to contain as many as this. The nearest approach is possibly that of Edwards (31) who reports a 2-decker nest with 25 eggs and 15 eggs. The smaller set, below the first, was believed to have been left by a previous parent. Other statements on this species mention egg numbers of 23, 24, 25, 27 laid (9), 27 in ovaries (21), 3 laid plus 34 unlaid (81), 24 laid (96), 20 to 23 laid (106), 28 laid (112). Incubation time is agreed upon at about 40 days (9, 96). Our own observations include one clutch of 23 eggs deposited July 24, each measuring about 16 mm long, 10 mm in diameter, each weighing about 1.0 gm. The parent, after her labors, weighed 15.3 gms. — scarcely two-thirds as much as her progeny! The event was complete before any eggs were discovered, but had taken place at night. Cahn (9) indicates evening as the time for nest-digging, night for oviposition. Under natural conditions the female effectively conceals her nest before morning by pushing the earth into the hole again. Winton's observation (110) of two sizes of *P. cornutum* emerging from hibernation would suggest that the young do not reach maturity until two years after their birth.

The early observations of Shufeldt (88, 89) on the ovoviviparous species have been extended by later students (33, 72, 73, 91, 94, 99, 102, 104). In all cases, the species involved is *P. douglassii*, and either *P. d. douglassii* (73, 88, 89, 104) or *P. d. hernandesi* (30, 33, 72, 91, 94, 102). Young of *P. d. douglassii* were born Aug. 10 (88) and 14 (73), and the litters involved included 24, all born tail first (88), 11 and 14 unwatched at night. The Aug. 10 litter was from a parent captive since May 15, which provides some information on gestation period. The births of *P. d. hernandesi* under observation are recorded to involve from 7 to 9 young (72), from 8 to 14 in late July or August (30), 12 in "mid or late summer" (33), and specific counts of 30 on July 27 (30), 15 on July 5 (91) and 13 (94). Two of these births (91, 94) were observed in the morning hours, the intervals between them averaging 5 minutes. Smith (91) records that all were born dorsum up, tail pressed against right side but fetus not curled, with a definite umbilicus, trace of which remained for several days. Stone & Rehn (94) remark that the bubble-like, transparent membrane containing the young is extruded in less than 2 minutes, and the young, if perfect, wriggle and clear themselves of the membrane in about 5 minutes; they measured the young to average 16 x 10 mm, and noted that they were narrow and cylindrical until they began to inhale air, when the form changed to broad and flat like the parents.

One of the *P. d. hernandesi* we maintained in captivity dropped 8 young on the night of July 25-26. Of these 7 were very active when discovered in the morning. Each followed tiny ants with bright eyes and great interest, but caught them with only moderate success. Larger insects seemed to frighten them; they scampered away in the opposite direction to avoid meeting a tar-nished plant bug (*Lygus pratensis* (Miridae), face to face.

On Aug. 24, another *P. d. hernandesi* dropped a litter. At about 11:00 a.m., 5 seemingly lifeless young were noted on the floor of the cage, and were removed to a fingerbowl. Two more were found similarly about 11:15 but no female could be recognized as the mother. At 11:30 the 8th youngster was dropped and the parent identified. She was transferred to separate quarters and in a few minutes extruded a yellow yolk mass with neither shell nor embryo. Additional young appeared at 11:47 (No. 9, right side up, hind end first), 11:53 (No. 10, on left side, head first), 11:59 (No. 11, back up, head first), 12:09 p.m. (No. 12, on right side, hind end first, with a small extra-embryonic yolk sac), 12:17 (No. 13, right side up, hind end first), 12:23 (No. 14, on right side, head first), 12:47 (No. 15, on back, head first). No more were forthcoming until the same female produced 6 more, all still-born, on the night of Sept. 1-2. The intervals thus averaged slightly over 6 minutes, half emerged head first, and there was no uniformity about dorso-ventral orientation (unless the lack of a ventral surface up and the predominance of right sides up are taken to be significant).

For most of the time between births, the mother remained quiet. As the next "labor" approached she would "shrug her shoulders" and curl her tail upward. While resting on chest and fore limbs, these writhing movements would pass posteriorly and lead her to elevate first one hind leg, then the other, extending each while it was completely off the ground. At this time her swollen cloacal area was dragging. Then she would raise herself on all four legs and creep forward very slowly, tail high, vent dragging, while the youngster appeared, enclosed in a transparent amniotic membrane with a clear colorless fluid. As the cloacal orifice closed again, the parent took a few steps forward, sometimes standing on her latest offspring as she did so. At no time did she show more concern for it than had it been one of the longer, more slender fecal pellets whose dimensions it approximated. Her ovoviparity included no further care for the new generation. Motherhood exertions totalled less than a minute apiece, from onset of visible movements to complete extrusion of the youngster.

Typical of the immediately post-natal development of the young is the record of No. 10, born at 11:53 a.m. At this time the amniotic sac was turgid, the tail curled under against the belly but the back otherwise straight, and the legs folded neatly at the sides. The whole presented a definitely cylindrical appearance, as described previously by Stone & Rehn (94). The eyes and nostrils were closed, and the back markings showed faintly on the sandy yellow ground color; the undersurfaces were grayish white. By 12:07 p.m. it had burst its sac at the anterior end, and extended its head sufficiently to get

the nostrils into the air. Irregular breathing movements commenced. As the fluid oozed from the broken sac, the lizardlet wriggled, and gradually shifted the limp membrane farther and farther posteriorly. At 12:12 the sac came free from the hind legs and tail; the youngster opened its eyes and ran actively forth. At 19 minutes of age its movements were clumsy enough that it turned a somersault and landed on its back. But almost at once it righted itself and scampered off again. By 12:55 it was dry and had taken on an ashy gray color dorsally. It was ready to fend for itself and began catching insects a millimeter or so in length. Already it was showing the nodding movements of the head so characteristic of its parents when these are brought from solitary confinement into the presence of others of their kind. Compensating reflexes were also present, demonstrated when the glass bowl was rotated slowly. Vision was obviously good. Placed with the parent, each youngster either climbed on her back or remained in her immediate vicinity.

The amniotic fluid from the broken sacs gave the fingerbowls containing the youngsters a distinct odor similar to that of albumen from a hen's egg. In several instances, an umbilical blood vessel connected the youngster to a small mass of vascular tissue suggesting an allantois or placenta. In one (No. 12), these vessels were involved in a mass of yolk perhaps 4 mm in diameter, slightly flattened against the ventral surface of the lizardlet. The yolk mass extruded between No. 8 and No. 9 gradually dried and contracted; soon it burst forth with a local extruded mass, which repeated the process on a still smaller scale.

Comparisons were made between mother and newborn young. The parent measured 115 mm from snout to tail tip, 85 mm from snout to cloacal fissure. The young were uniformly 29 and 23 mm respectively in these dimensions. The parent weighed 18.5 gm., the youngsters from 0.8 to 1.1 gm., after drying off. Thus the young are appreciably larger than those of *P. cornutum*, the complete eggs of which at laying weighed only 1.0 gm. The Texan *P. cornutum* is correspondingly lighter (15.3 gm.) The complete litter of *P. d. hermandesi* presented a net live weight (estimating for the stillborn young on the basis of the viable young, and omitting the yolk mass extruded separately) of about 21 gms. Since this is in completely organized tissues, not in the stored form contained in eggs, the progeny undoubtedly represent a greater parental effort than the statistically larger value obtained for *P. cornutum* (see above). These weights are slightly higher than those recorded by Tanner (99).

MOLTING AND BLOOD EJECTION

Exuviation — the shedding of the old epidermis — presents considerable difficulty to reptiles with heavy skulls, and a special "swell mechanism" is present in many to achieve the desired goal with dispatch. *Phrynosoma*, like many others, has a sphincter muscle around the internal jugular vein, through which all blood from the head must return to the general circulation. If this muscle contracts and at the same time the lizard's heart beats rapidly and forcefully, the cephalic vessels become greatly dilated. Those around

eyes, lips, nostrils and ears become so distended that the epidermis is torn away and falls free in large flakes. The action of this swell mechanism was investigated by Bruner (4), following a description of the molting process in *Phrynosoma* by Hoffman (44).

Particular interest is attached to exuviation and the swell mechanism in horned toads because of the uncanny habit in these animals of emitting jets of blood from the eyes. Wallace (103) mentioned this phenomenon. Hay (42) gave the first clear description. Others repeated the story, extended the observations and popularized the subject (3, 29, 45, 49, 83, 108). Winton (108, 110) investigated the suggestion that the blood issued from the cornea only after this tissue had been weakened by some parasite—possibly a mite such as had been observed infesting a horned toad. He found no evidence of either parasitism or damage. Burleson (3) found rupture through the ventral wall of the conjunctival sac, while others reported its origin as in the nictitating membrane. Observations involving species other than *P. cornutum* accumulated (5, 29, 83, 108). Ejection of blood was brought on by the presence of a dog (3), or by simply stroking the top of the lizard's head (83)—especially in afternoons of mid-summer. Emphasis has been placed on the phenomenon being related to molting or in freshly molted individuals. We have been unable to induce specimens of either *P. cornutum* or *P. douglassii* to demonstrate the blood ejection. We have subjected them to gnawing by young dogs, to all manner of handling, even to "assisting" them by peeling off great areas of molting skin from belly, back, head and eyelids. Our observations include several dozen specimens and extend from June to October for *douglassii*, throughout the year for *cornutum*. Apparently many other factors are involved in eliciting the response.

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* In his summary of the information concerning *P. cornutum*, Smith indicated (92) the need for a garnering of the scattered references on the life history of horned toads. The present is undoubtedly incomplete. Except for taxonomic and distributional studies, it includes all that we have been able to find for both *P. cornutum* and *P. douglassii*. Relevant natural history material on other species has been inserted.

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45. HOLDER, C. F. 1901—A curious means of defence. Sci. Amer. 85: 186-187. Popularization of the blood-ejection behavior, with record of a 6-foot throw.
46. HORNADAY, W. T. 1914—American Natural History (Scribners), vol. 4: 63-64. A popular account of the habits.
47. HUGHES, R. C., BAKER, J. R. & C. B. DAWSON 1941—The tapeworms of reptiles, Part 1. Amer. Midl. Nat. 25: 454-468. *P. cornutum* from Texas (p. 464) containing *Ocochoristica phrynosomatis* Harwood 1932.
48. HUDSON, G. E. 1942—The amphibians and reptiles of Nebraska. Neb. Conserv. Bull. 24: 2-146.
49. HURTER, J. (SR.) 1911—The herpetology of Missouri. Trans. Acad. Sci. St. Louis 20: 59-274. *P. cornutum* (pp. 133-135), several specimens, squirted blood in his face; quotes No. 42 and No. 96.
50. KAUFFELD, C. F. 1943—Field notes on some Arizona reptiles and amphibians. Amer. Midl. Nat. 29: 345. Egg laying in *P. cornutum* though not observed; *P. d. hernandesii* at 8000' elevation on Carr Peak, Huachuca Mountains, Arizona.
51. KEELER, C. E. 1930—A histological basis to explain constant differences in action

- current responses from certain points in the retina of the horned toad, *Phrynosoma cornutum*. Journ. Morph. & Physiol. 50(1): 193-208, 9 figs. Found almost pure cone retina, good fovea, spongy pecten: variations in cone form with retinal area from which obtained.
52. KING, F. W. 1932—Herpetological records and notes from the vicinity of Tucson, Arizona, July and August 1930. Copeia 1932(4): 175-177. *P. d. hernandesi* (p. 177) at 9000' elevation on Mount Baldy.
53. KNOWLTON, G. F. 1934—Lizards as a factor in the control of range insects. Journ. Econ. Entom. 27: 993-1004. *P. d. ornatissimum* stomach contents examined as check on control of ants in Utah, since large areas of land surrounding mounds are kept free of foliage plants, helping further reduce the 5% of tillable land in the state. The 27 stomachs examined contained 502 ants, 58 other insects, 117 parasitic roundworms.
54. ——— 1942—Range lizards as insect predators. Journ. Econ. Entom. 35(4): 602-603. *P. d. ornatissimum* in Utah, 2 stomachs with 257 ants and assorted other insect prey, all partly identified.
55. ——— & M. J. JONES 1932—Studies of the food habits of Utah lizards. Ohio Journ. Sci. 32: 467-470. List of prey of *P. d. ornatissimum*.
56. ——— AND ——— 1933—Lizards as predators of the beet leafhopper. Journ. Econ. Ent. 26: 1011-1016. *P. d. ornatissimum* collected chiefly among greasewood, Russian thistle and sagebrush; this and *P. platyrhinos* appear to be of little importance as predators of leafhopper *Eutettix tenellus*.
57. ——— & ——— 1934—Distribution and food habit notes on Utah lizards. Copeia 1934(1): 10-14. Food chiefly ants, *P. d. ornatissimum*; also *P. platyrhinos* from Great Salt Lake Desert.
58. ——— & J. S. STANFORD 1942—Reptiles eaten by birds. Copeia 1942(3): 186. *P. d. ornatissimum* in stomach of Swainson's Hawk killed July 27 in Clover, Utah.
59. ——— & W. L. THOMAS 1934—Notes on some insectivorous Utah lizards. Proc. Utah Acad. Sci. Arts & Lett. 11: 257-259. Insect stomach contents of *P. d. ornatissimum* and *P. platyrhinos*, chiefly ants.
60. ——— & W. L. THOMAS 1936—Food habits of Skull Valley lizards. Copeia 1936(1): 64-66. Insect stomach contents of *P. d. ornatissimum* and *P. platyrhinos*, chiefly ants. Also many roundworms.
61. LITTLE, E. L., JR. & J. G. KELLER 1937—Amphibians and reptiles of the Jornada Experimental Range, New Mexico. Copeia 1937(4): 216-232. *P. cornutum* (p. 219) caged on ant hill killed by ants; another with 100 small nematodes.
62. LOCKWOOD, S. 1883—Maternal anxiety in a horned toad. Amer. Nat. 17: 682-683. Hearsay evidence; the same story today would appear only as a space-filler in a tabloid newspaper.
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64. LOENNBERG, E. 1902—On some points of relation between the morphological structure of the intestine and the diet of reptiles. K. Svenska Vet.-Akad. Handl. 28(14): No. 3: 1-51, 2 pls. Gut of *P. cornutum* described (p. 24), illustrated (fig. 7). Colon & rectum distinct, latter well developed for water salvage; gut contained insect remains, also vegetable debris and considerable sand.
65. MANN, W. M. 1930—Wild animals in and out of the zoo. Smithsonian. Sci. Ser. 6: 338-345. Mentions *P. cornutum* kept captive for 20 months.
66. MESERVEY, A. B. & E. L. CHAFFEE 1927—Electrical response of the retina in differ-

- ent types of cold-blooded animals. Journ. Optical Soc. Amer. 15: 311-330. *P. cornutum* the experimental animal.
67. MILNE, L. J. 1938—Mating of *Phrynosoma cornutum*. Copeia 1938(4): 200-201. Use of left temporal horn as mouthbite for clasping ♂. Question raised as to mode of attachment in species with horns less developed.
- 67A. — AND M. J. MILNE 1948—Arizona is the Horned Toad State. Arizona Highways 24 (10): 24-27, 7 figs. (Oct.)
- 67B. — AND — 1949—We shadowed the horned toad. Nat. Hist. 58 (2): 86-94, 9 photos. (Feb.)
- 67C. — AND — 1949—The horned toad—Desert oddity. Audubon Mag. 51 (6): 362-366, 5 figs. (Nov.-Dec.)
68. MORGAN, B. B. 1942—The nematode genus *Skryabinoptera* Schulz, 1927. Lloydia 5(4): 314-319. *S. phrynosoma* (Ortlepp) from various hosts other than *Phrynosoma cornutum*.
69. MORRIS, D. J. 1926—Horned lizard of the Southwest. Nature Mag. 7(2): 94-95. A popular, illustrated account of *P. cornutum*. For error in stated fact or identification, compare with No. 9.
70. NOBLE, G. K. & H. T. BRADLEY 1933—The mating behavior of lizards; its bearing on the theory of sexual selection. Ann. N. Y. Acad. Sci. 35: 25-100. Quote breeding habits of *P. cornutum* from Nos. 9, 31, 37.
71. ORTLEPP, R. 1922—The nematode genus *Physaloptera* Rand. Proc. Zool. Soc. Lond. 999-1107. From *P. cornutum* a new species *Physaloptera phrynosoma*.
72. OVER, W. H. 1923—Amphibians and reptiles of South Dakota. Bull. Univ. So. Dak. 23 (10) No: 12: 1-34, 18 pls. *P. d. hernandesi* a viviparous species (p. 19) with 7 to 9 young (pl. 1, fig. 2).
73. PACK, H. J. 1918—Some habits of the pigmy horned lizard. Copeia No. 63: 91-92. *P. d. douglassii* from a low alkaline area west of Salt Lake City; birth of 11 and 14 young at night (Aug. 14); 20 adults in 3 hours' collecting on 10 acres.
74. PARKER, G. H. 1938—Color changes in lizards, particularly in *Phrynosoma*. Journ. Exper. Biol. 15: 48-73. *P. blainvillii* from Pasadena, Calif., studied for effects of nervous control, pituitary and adrenal effects, temperatures, light and dark, and direct stimulation of melanophores. Found blanching due to nerve fibers to melanophores, "hydro-humor" probably adrenalin, direct response to darkness and to high temperatures; darkening due to pituitary neurohumor, direct response to strong light, often to low temperatures; no dispersing nerve fibers; excellent photographs.
75. POTTER, G. E. 1931—Suffocation point in the horned lizard, *Phrynosoma cornutum*. Science (n. s.) 73: 314-315. Experimental study to check newspaper account of horned toad sealed in a cornerstone, alive after many years without food or air. Found death ensued in 10 days at 23° to 26°C., in 2 to 3 days at 35°C., in 2 months hibernating at 10°C. if confined with a liter of air; at death point, air reduced to 4 to 5.5% oxygen, with 12 to 15% carbon dioxide. Repeated with device for absorbing carbon dioxide and life continued until oxygen dropped to 3.2%. Hence carbon dioxide reached lethal concentrations before oxygen lack became limiting.
- 75A. — AND S. O. BROWN 1941—Color changes in *Phrynosoma cornutum*. Trans. Procs. & Spec. Publ. Texas Acad. Sci. 24: 7.
- 75B. — AND — 1942—Effect of sex and gonadotropic hormones on the development of the gonads in *Phrynosoma cornutum* during reproductive and non-reproductive phases. *Ibid.* 25: 55-56.
76. — & H. B. GLASS 1931—A study of respiration in hibernating horned lizards,

- Phrynosoma cornutum*. Anat. Rec. 51(1) Suppl. No. 11. Oxygen consumption when active 135 cc. per kilogram of animal per hour, when hibernating only 7 cc./kg./hr. Except for CO₂ retained during initial shock of entry into hibernation, R.Q. is the same winter & summer.
77. ——— & ——— 1931a—A study of respiration in hibernating horned lizards, *Phrynosoma cornutum*. Copeia 1931(3): 128-131. In central Texas, lizards bury self in late October to early November, reappears in late March or early April. One kept with no water and only one feeding in winter died in mid July. In hibernation respiratory quotient from 0.40 to 0.77 (from 0° to 18°) with no close correlation with torpidity; when not in hibernation, R.Q. 0.60 to 0.75 at 32° to 35°C.
78. PRITCHETT, A. H. 1903—Some experiments in feeding lizards with protectively colored insects. Biol. Bull. 5: 271-287. *P. cornutum* merely recorded as very fond of ant *Pogonomyrmex barbatus* var. *molefaciens*.
79. REDFIELD, A. C. 1918a—The physiology [sic] of the chromatophores of the horned lizard. Copeia No. 53: 13-14. Abstract of No. 80.
80. ——— 1918b—The physiology of the melanophores of the horned toad, *Phrynosoma*. Journ. Exper. Zool. 26: 275-333. Careful experimental study, with good illustrations.
81. REESE, A. M. 1922—Egg laying by the "horned toad" *Phrynosoma cornutum*. Copeia No. 103: 15-16. Corrects No. 35 on universal viviparity, cites ♀ which laid 3 eggs June 7-8, then died; autopsy showed 34 more, all alike; no embryos found.
82. ROUDABUSH, R. L. & G. R. COATNEY 1937—On some blood protozoa of reptiles and amphibians. Trans. Amer. Micros. Soc. 56: 291-297. Surprise at finding no blood protozoa in either of 2 *P. d. hernandesi* examined.
83. RUETHLING, P. D. R. 1919—Blood expelling of the horned lizards in Mexico. Copeia 72: 67-68. *P. orbicularis* and *P. taurus* from Valley of Mexico expelled blood from eyes, especially in afternoons of mid summer, if top of head rubbed.
84. RUTHVEN, A. G. 1907—A collection of reptiles and amphibians from southern New Mexico and Arizona. Bull. Amer. Mus. Nat. Hist. 23: 483-604. *P. cornutum* (pp. 547-550, fig. 22) color, habitat and food; *P. d. hernandesi* (pp. 542-544) at Cloudcroft, New Mexico (elevation 9500').
85. ——— 1915—An interpretation of the distribution of the reptiles of the Maggie Basin, Nevada. Bull. Amer. Geogr. Soc. 47: 948-952. Records *P. d. hernandesi* not uncommon on fine soil.
86. ——— & H. T. GAIGE 1915—The reptiles and amphibians collected in northeastern Nevada by the Walker-Newcomb expedition of the University of Michigan. Occ. Papers Mus. Zool. Univ. Mich. 8: 1-33.
87. SCHONBERGER, C. F. 1945—Oviposition by *Phrynosoma solare*. Copeia 1945(1): 53-54. Captive laid 28 eggs in sand box, rolled each in dry sand and buried in rows, all handling done by the body, none by the limbs. Only dry surface sand used; anal region used to level and then roughen the sand surface above the buried eggs.
88. SHUFELDT, R. W. 1885—Probable period of gestation in the horned toad. Science 6: 185-186. *P. d. douglassii* caught May 15 produced 24 young Aug. 10, of which 2 lived, rest died in sac; all born tail first.
89. ——— 1896—Life habits of *Phrynosoma*. Science (n. s.) 3: 867. Further comments on ovoviviparity in *P. d. douglassii*.
90. SIMONS, R. 1884—Zur Pflege von *Phrynosoma cornutum*. Jahresh. Naturf. Ver. Elberfeld 6: 148-154. Parental care claimed for *P. cornutum*.

91. SMITH, C. F. 1941—Birth of horned toads. *Copeia* 1941(2): 114. Captive *P. d. hernandesi* from Cochise County, Arizona, on July 5 bore 10 prior to 9:30 a.m., then one each at 9:30, 9:42, 9:55, 10:30, 10:45; all dorsum up, tail pressed against right side but fetus not curled; motionless 5 to 55 minutes; definite umbilicus, trace of it remaining for several days.
- 91A. SMITH, H. M. 1934—Notes on some lizards of the genus *Phrynosoma* from Mexico. *Trans. Kansas Acad. Sci.* 37: 287-297, 2 pls. Miscellaneous notes on six species.
92. SMITH, H. M. 1946—Handbook of Lizards. (Comstock Publ. Co.) pp. 1-557. Systematic survey, containing analysis of *Phrynosoma* species and guide to much of the literature, with life history notes abstracted, grouped under each species.
93. STRING & LACORDAIRE (initials not given) 1842—Notes sur quelques points de l'organisation du *Phrynosoma harlanii*, Saurien de la famille des Iguaniens. *Bull. de l'Acad. Roy. des Sci. et Belles-Lettres de Bruxelles* (1) 9 (2): 192-209, pl. 9. Gross anatomy of *P. cornutum* from Texas.
94. STONE, W. & J. A. G. REHN 1903—On the terrestrial vertebrates of portions of southern New Mexico and western Texas. *Proc. Acad. Nat. Sci. Phila.* 55: 16-34. *P. d. hernandesi* in captivity bore 13 young, 4 before 10:05 a.m., then one about every 5 minutes. Parent stood as high as possible on hind legs; bubble-like transparent membrane containing young, extruded completely in less than 2 minutes; young, if perfect, wriggled and cleared self of membrane about 5 minutes after birth; young narrow, cylindrical, becoming broad and flat as soon as begin to inhale air; 16 x 10 mm. Some, perhaps premature, with no signs of life, doubled up, surrounded by glutinous mass.
95. STRECKER, J. K. JR. 1908—The reptiles and batrachians of McLennan County, Texas. *Proc. Biol. Soc. Wash.* 21: 69-84.
96. ——— 1908—Notes on the breeding habits of *Phrynosoma cornutum* and other Texas lizards. *Proc. Biol. Soc. Wash.* 21: 165-170. Set of *P. cornutum* eggs at 6 to 7 inches deep in 4 layers of 6 each; incubation period about 40 days; breeding season from mid April to latter part of July.
97. ——— 1927—Observations on the food habits of Texas amphibians and reptiles. *Copeia* No. 162: 9. *P. cornutum* eating ants and insect larvae.
98. STUART, L. C. 1932—The lizards of the middle Pahvant Valley, Utah; materials for a study in saurian distribution. *Occ. Papers Mus. Zool. Univ. Mich.* 11 (No. 244): 1-33, 3 pls. *P. d. hernandesi* (p. 30) at 9000' elevation in Pahvant Mountains.
99. TANNER, V. M. 1942—Notes on the birth and growth of horned lizards. *Great Basin Nat.* 3(2): 60.
100. VAN DENBURGH, J. 1897—The reptiles of the Pacific Coast and Great Basin. *Occ. Papers Calif. Acad. Sci.* 5: 1-236.
101. ——— 1922—The reptiles of western North America. *Occ. Papers Calif. Acad. Sci.* 10: 1-611.
102. ——— & J. R. SLEVEN 1913—A list of the amphibians and reptiles of Arizona, with notes on the species in the collection of the Academy. *Bull. Calif. Acad. Sci.* 4(3): 391-454, pls. 17-28. *P. d. hernandesi* (pp. 405-406) large ♀ contained "a number" of young in July.
103. WALLACE, J. 1871—Extract from letter addressed to A. R. Wallace, from Stockton, Calif., regarding blood ejected from eyes of *Phrynosoma*; species not given. *Proc. Zool. Soc. Lond.* 1871: 1-2. A note read at a meeting of the Society.
104. WATSON, J. R. 1911—A contribution to the study of the ecological distribution of the animal life of north central New Mexico with special attention to the insects. *Rep. Nat. Res. Surv. N. Mex.* 1: 57-117. Observation that *P. d. douglasii* is viviparous.
105. WEESE, A. O. 1917—An experimental study of the reactions of the horned lizard, *Phrynosoma modestum* Gir., a reptile of the semi-desert. *Biol. Bull.* 32: 98-

116. Ate earthworms, snapped up lead shot rolling down incline; tilted body in orientation to sun early in morning and late in evening; very dry air stimulated animal to dig into soil.
106. — 1919—Environmental reactions of *Phrynosoma*. Amer. Nat. 53: 33-54. *P. modestum* from Albuquerque, N. Mex., around 5200' elevation, *P. d. ornaticornis* from the same area, and *P. cornutum* from Alamogordo, N. Mex., where the mean temperature is about 5° higher than at Albuquerque. Described self-burial when heat too great; sand grains driven by wind snapped up as though food; urine nitrogen practically all in form of uric acid. Observed 23 eggs deposited by *P. cornutum* on July 7 between 11 a.m. and 1 p.m., in sand of cage bottom; several times during period of next two weeks, eggs found, always in lots of about 20. None hatched though embryos 6 mm. long were examined a week after deposition. A few *P. modestum* eggs found, with no leathery shell; probably aborted.
107. WINTON, W. M. 1914—A note on the distinction of sexes in *Phrynosoma*. Science (n. s.) 40: 311-312.
108. — 1914—An examination of blood ejecting horned lizards. Science (n. s.) 40: 784-785. Careful study of several blood-squirting specimens failed to demonstrate any parasites or indication of any. This was to check on suggestion that cornea had been weakened by a parasite, perhaps a mite, so that rupture was easy.
109. — 1915—A preliminary note on the food habits and distribution of *Phrynosoma cornutum*. Copeia.
110. — 1916—Habits and behavior of the Texan horned lizard, *Phrynosoma cornutum* Harlan, I. Copeia No. 36: 81-84. A careful study; found appearing in mid April (Fort Worth), clearly of 2 sizes—125 mm. adults and 50 mm. young from hatch of preceding autumn; most important moult during first 2 weeks of July; blood ejection most conspicuous then; 7 records of this added since No. 108; large grasshoppers or even snails eaten; hypnosis discussed by No. 5 extended, in that after putting animal into unresponsive state by touching region of pineal body a few times with finger tip (or stroking top of head), an animal showing signs of awakening (though eyes still closed) can be returned to the hypnotic state by a few gentle passes in the air over the pineal region; possible photosensitivity of this region is suggested.
111. — 1917—Habits and behavior of the Texan horned lizard, *Phrynosoma cornutum* Harlan, II. Copeia No. 39: 7-9. Back of lizard sensitive to stings of large ant that forms chief food, though swallows these insects alive and entire; mentions tail wagging when irritated, and that males sometimes fight each other in hot weather; all disappear from Ft. Worth surface around mid September to early October.
112. WOOD, S. F. 1936—Oviposition and embryos of some western lizards. Copeia 1936 (1): 69-70. Captive *P. m'callii* from New Mexico laid 28 eggs on July 18, each about 37 somite stage. Misidentification of *P. cornutum* indicated by No. 92.
113. — 1936—Courtship behavior of some western lizards. Copeia 1936(3): 117. Found *P. blainvillii* male gripped mate on left side of neck, then raised himself on fore legs, jerked head quickly to the right at the same time pushing forward on all fours, turning female over on her back.
114. WOODBURY, A. M. 1931—A descriptive catalogue of the reptiles of Utah. Bull. Univ. Utah 21: 1-129.
- 114A. WRITERS' PROGRAM OF THE W.P.A. IN THE CITY OF NEW YORK 1947—American Wildlife Illustrated xiv+749 pp. (Wm. H. Wise & Co.) Information on horned toads pp. 318-321 seems to be from original observations though contributes nothing new.
115. ZIPPERLEN, A. 1885—Eidechsen in Terrarium. Zool. Garten 26: 366-368. Popular account of activity in captivity, including feeding on mixed insects.

Growth and Feather Development of Towhee Nestlings

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In recent years there have appeared several accounts dealing with growth and feather development of passerine species, among them those of Boulton (Auk, 1927. 44: 387-414) and Welter (Wilson Bull., 1936. 48: 256-269). However, there appears to be a paucity of information relative to growth and feather development of the red-eyed towhee, *Pipilo erythrophthalmus erythrophthalmus*.

A few years ago the writer made a rather intensive study of the breeding habits of this species in the vicinity of Morehead, Rowan County, Kentucky. During the course of the study nestlings were weighed daily, and a series of young of known ages was collected in order to study feather development.

GROWTH

All the young that were weighed daily left the nest when they were seven days of age. Accordingly, these observations on weight gain extend only over the eight days spent in the nest. All weights were taken at approximately the same time each day by means of a Cenco balance. The average weight, in grams, at each day is given below; the figures in parenthesis indicate the number of birds weighed at each age.

At hatching, 3.16 (12); one day of age, 6.5 (12); two days of age, 9.8 (13); three days of age, 12.7 (11); four days of age, 15.2 (11); five days of age, 17.66 (11); six days of age, 21.24 (7); seven days of age, 22.47 (3).

While the average daily gain was 2.76 grams, the gain over the eight-day period, with one exception, decreased rather consistently as the birds grew older. One-day-old birds showed an average gain of 3.34 grams over birds at hatching, while seven-day-old birds showed an average gain of only 1.23 grams over six-day-old birds.

Various measurements were taken of at least one towhee at each age from one to eight days, inclusive. All measurements were taken in millimeters, and the following chart sets forth the more important of these. The figures in parenthesis indicate the number of birds measured at each age.

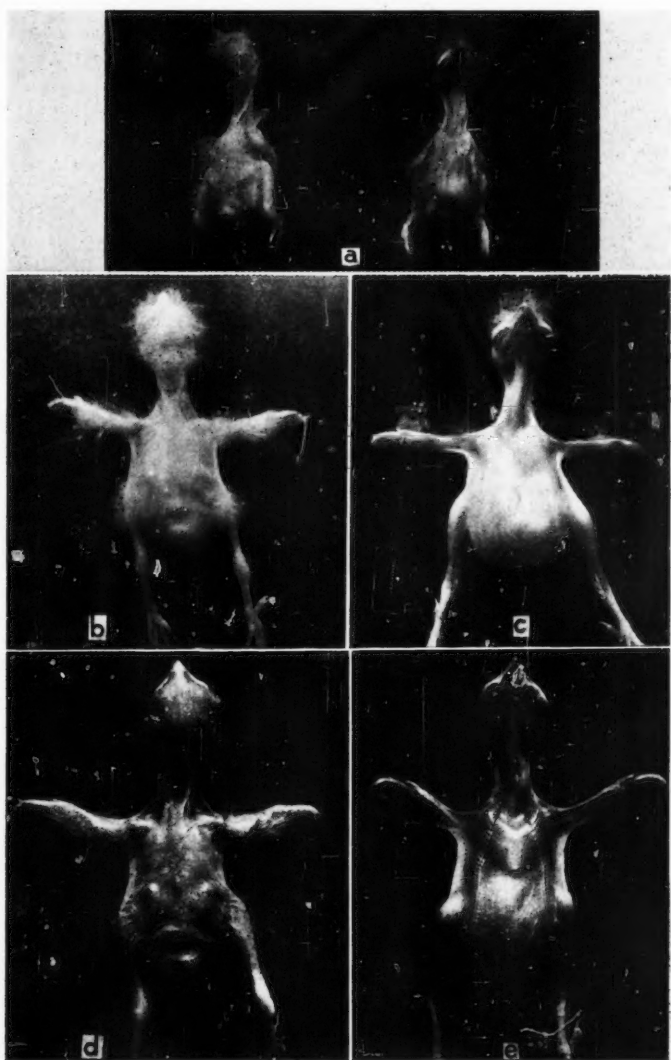


Fig. 1.—a. Dorsal and ventral views of the newly-hatched young; b. Dorsal view of one-day-old bird; c. Ventral view of one-day-old bird; d. Dorsal view of two-day-old bird; e. Ventral view of two-day-old bird.

TABLE 1.—Growth of young red-eyed towhees.

	Age in days							
	1 (3)	2 (4)	3 (1)	4 (2)	5 (2)	6 (4)	7 (1)	8 (1)
Length	41.30	54.75	66.00	70.00	68.50	75.00	85.00	96.00
Extent	34.00	51.25	63.00	75.50	80.50	111.20	139.00	173.00
Wing	6.00	8.00	12.00	18.00	21.00	27.00	35.00	43.00
Tarsus	7.30	11.50	13.50	18.00	20.50	21.25	24.00	27.00
Culmen	5.00	5.75	7.00	8.25	8.75	8.85	9.00	10.00
Gonys	1.50	2.00	2.50	2.75	2.75	2.87	4.00	5.00
1st primary .....		.31	1.00	3.75	5.75	9.37	15.00	19.00
1st secondary			1.00	3.25	6.25	11.25	18.00	27.00
1st rectrix .....						.87	1.50	5.00
6th rectrix .....					.35	1.50	2.25	6.00

FEATHER DEVELOPMENT

In the following account, feather development is treated at each day of age under the headings of the feather tracts. Where no information is given under a specific tract for a given age, no developments, other than an increase in length of existing feathers, was noted.

ONE DAY OF AGE

Capital tract: Sheaths apparent beneath skin in occipital, superciliary, and coronal regions.

Spinal tract: Sheaths apparent beneath skin throughout the tract, less apparent in anterior cervical region.

Caudal tract: Down preceding rectrices through skin; five outer rectrices on each side barely visible; two middle rectrices more obvious beneath skin.

Ventral tract: No feather sheaths apparent.

Humeral, femoral, and crural tracts: Down present in humeral and femoral tracts.

Alar tract: Down present; no feather sheaths apparent.

TWO DAYS OF AGE

Capital tract: Sheaths in auricular regions apparent beneath skin.

Spinal tract: Sheaths in mid-dorsal region through skin.

Caudal region: All rectrices readily visible beneath skin.

Ventral tract: Sheaths visible beneath skin; dark in cervical region, lighter posteriorly.

Humeral, femoral, and crural tracts: Sheaths apparent beneath skin in humeral and crural tracts, breaking through skin in femoral tract.

Alar tract: Primaries and secondaries barely through skin; greater primary coverts, carpal remex covert, the greater secondary coverts, the lesser secondary coverts, the alula, the alula coverts, the marginal coverts, and the tertiaries visible beneath the skin.

THREE DAYS OF AGE

- Capital tract: Malar and sub-malar sheaths apparent beneath skin.
Spinal tract: All sheaths through skin; interscapular sheaths longest.
Caudal tract: A few sheaths began to break through the skin.
Ventral tract: A few sheaths beginning to break through the skin.

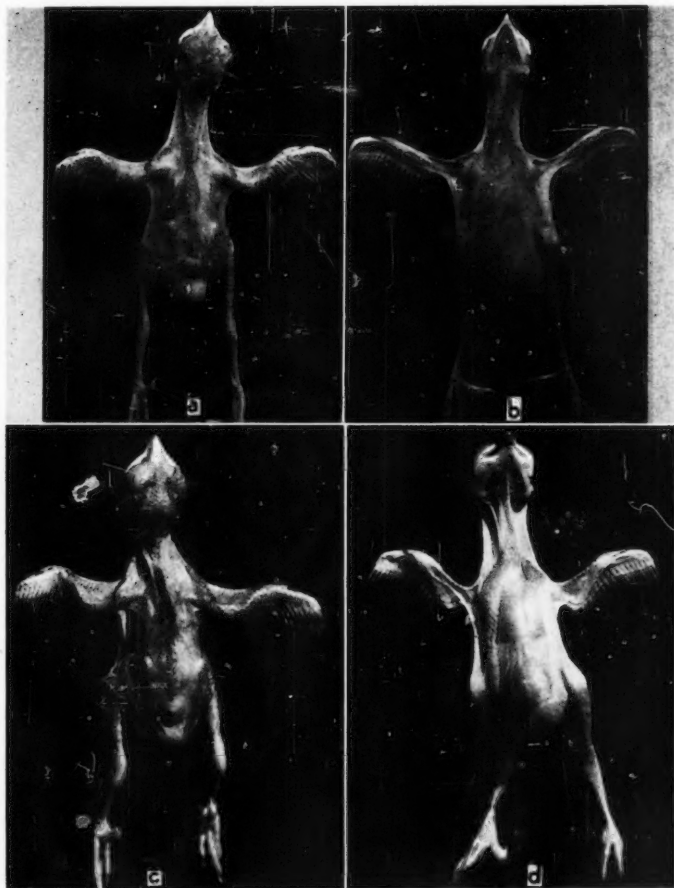


Fig. 2.—a. Dorsal view of three-day-old bird; b. Ventral view of three-day-old bird; c. Dorsal view of four-day-old bird; d. Ventral view of four-day-old bird.

Humeral, femoral, and crural tracts: All sheaths well out in femoral tract, breaking through skin in humeral and crural tracts.

Alar tract: Primaries and secondaries well out, the primaries more apparent; the greater primary coverts, the carpal remex covert, the greater secondary coverts, the first tertiary, the alula, and the alula coverts broke through the skin. The outer six middle primary coverts became apparent beneath the skin.

FOUR DAYS OF AGE

Capital tract: Sheaths in the occipital and coronal regions broke through the skin; auriculars began to break through.

Spinal tract: Interscapular sheaths longest; cervical and pelvic sheaths shortest and approximately equal in length.

Caudal tract: Upper coverts broke through skin.

Ventral tract: All sheaths well out.

Humeral, femoral, and crural tracts: All sheaths in the crural region through the skin; sheaths more apparent in humeral tract. Feathers in the femoral tract began to break from their sheaths.

Alar tract: The four tertiaries, the lesser secondary coverts, and the middle primary coverts broke through the skin; down still present on the greater and lesser secondary coverts.

FIVE DAYS OF AGE

Capital tract: All sheaths through the skin except in the sub-malar and post-auricular regions.

Spinal tract: Down still present on a few sheaths.

Caudal tract: Rectrices broke through the skin, inner two longer; down still present on outer rectrices. Five upper coverts on each side well out; under coverts began to break through the skin.

Ventral tract: Feathers in the sternal region began to break through their sheaths.

Humeral, femoral, and crural tracts: Feathers in the crural region began to break through their sheaths; all sheaths in humeral tract through the skin.

Alar tract: Under wing coverts apparent beneath the skin; the middle primary coverts and the alula began to break through their sheaths.

SIX DAYS OF AGE

Spinal tract: Feathers in the interscapular region broke through sheaths.

Caudal tract: Under coverts all out; down present on ends of a few rectrices.

Ventral tract: Feathers in cervical region began to break through sheaths; a few feathers in the posterior ventral region began to break through sheaths. Feathers in the sternal region well through sheaths.

Alar tract: The primaries, secondaries, tertiaries, and all coverts except the under and middle secondary began breaking through their sheaths; the middle secondary coverts broke through the skin.

SEVEN DAYS OF AGE

Capital tract: Feathers in occipital and coronal regions broke through sheaths; post-auriculars and sub-malars through skin.

Spinal tract: All feathers through sheaths except in anterior cervical region.

Caudal tract: Five upper coverts on each side through sheaths; little down remaining.

Ventral tract: All feathers well out of sheaths except in the anterior cervical region.

Humeral, femoral, and crural tracts: All feathers completely through sheaths.

Alar tract: The middle secondary coverts began to break through sheaths; under coverts began to break through skin.

EIGHT DAYS OF AGE

Capital tract: Superciliary, auricular, and post-auricular feathers through their sheaths.

Spinal tract: All feathers through sheaths.

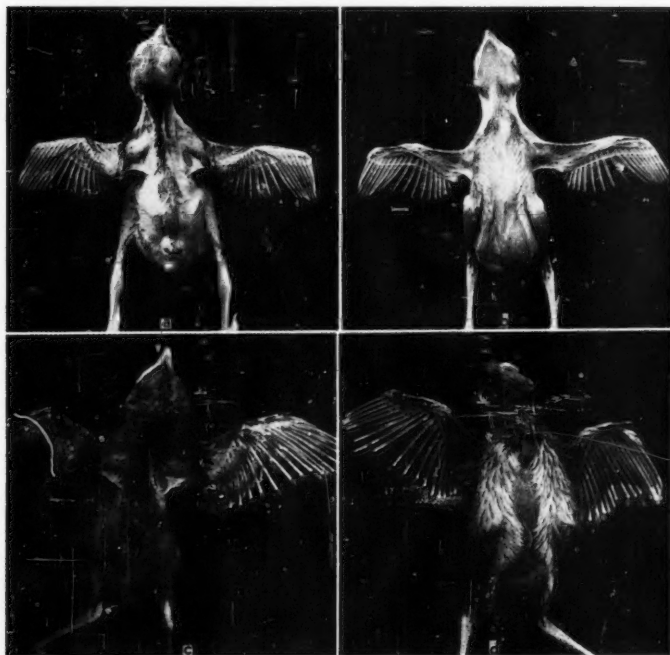


Fig. 3.—a. Dorsal view of five-day-old bird; b. Ventral view of five-day-old bird; c. Dorsal view of six-day-old bird; d. Ventral view of six-day-old bird.

Caudal tract: Rectrices and under coverts began to break through sheaths.

Immediately above the two inner rectrices two inner upper coverts broke through the skin.

Ventral tract: All feathers through their sheaths.

Alar tract: Under coverts broke through sheaths.

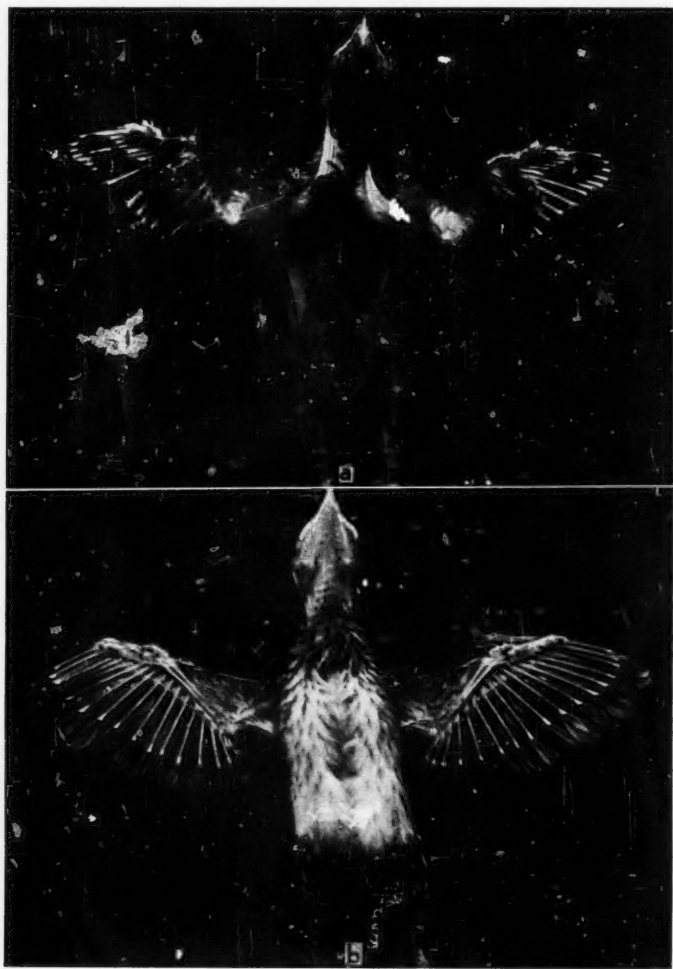


Fig. 4.—a. Dorsal view of seven-day-old bird; b. Ventral view of seven-day-old bird.

SUMMARY OF FEATHER DEVELOPMENT

In the capital tract, growth was first apparent in the occipital region. From there it proceeded rapidly forward and under the head. When all the sheaths were visible beneath the skin, those in the occipital and coronal regions began to break through the skin, and growth followed the same pattern as in the appearance of the sheaths beneath the skin. When all the sheaths had broken through the skin, the feathers in the occipital region began to break through their sheaths, and the remaining sheaths were broken in the same pattern outlined above. The post-auriculars and sub-malaris were the slowest regions to reach the three developmental stages outlined above.

In the humeral and femoral tracts, growth proceeded from the posterior to the anterior regions. Growth in the femoral region preceded that in the humeral and crural regions by about one day. The humerals were the last to break through their sheaths, and the femorals were the first.

In the ventral tract, growth was first apparent in the axillary region and proceeded anteriorly and posteriorly from that point. However, growth proceeded anteriorly much more rapidly than posteriorly.

In the alar tract, the primaries and the secondaries were the first to appear. Growth was very rapid between the ages of one and two days. There was no evidence of feather sheaths on the one-day-old birds, but on the two-day-old birds, the primaries and secondaries had broken through the skin. When the primaries and secondaries broke through the skin, all the coverts except the lesser primary coverts appeared beneath the skin, and growth apparently pursued a course from the tip of the wing toward the body. The under wing coverts next appeared beneath the skin, and the alula and middle primary coverts broke through their sheaths. After all other feathers of the upper surface of the wing had broken through their sheaths, the middle secondary coverts put in their appearance, and broke through sheaths shortly before the under wing coverts, these being the last to do so.

In the spinal tract, growth proceeded much as it did in the ventral tract. Growth first became apparent near the center of the tract and proceeded both anteriorly and posteriorly. However, in this tract, the most anterior part of the cervical region was the slowest to develop.

In the caudal tract, the rectrices were the first to put in their appearance. Growth in the rectrices followed a course from the inner two outward. The upper outer coverts next became visible, followed by the under coverts. The inner coverts were the last to put in their appearance. Although the rectrices were the first to appear, the outer upper coverts were the first to break through the skin, followed in order by the rectrices, the under coverts, and the inner upper coverts.

The Striped Dolphin, *Lagenorhynchus obliquidens* Gill 1865, on the Coast of North America

Victor B. Scheffer

U. S. Fish and Wildlife Service, Seattle, Washington

DISTRIBUTION

The systematic positions of the various dolphins now described under *Lagenorhynchus* have recently been studied by Bierman and Slijper (1947-1948). It is "highly probable," they state, that *obscurus*, *fitzroyi*, *superciliosus*, *cruciger*, *wilsoni*, and *australis* all belong to the same species, *Lagenorhynchus cruciger* (Quoy et Gaimard, 1824). However, "it is still doubtful [sic] whether *Lag. obliquidens* Gill from North Pacific belongs to this species or not" (1948, p. 17). In view of the fact that several thousands of miles, and the equatorial belt, separate the known ranges of *cruciger* (in the sense of Bierman and Slijper) and *obliquidens* I believe that we can safely consider the two as distinct species until evidence to the contrary appears.

The range of *Lagenorhynchus obliquidens* lies in the coastal temperate waters of the North Pacific Ocean. In American waters the range is limited on the south by Ballenas Bay, Mexico, and on the north by Valdez, Alaska. Through the kindness of scientists in various museums I have been able to assemble 32 records, some of them complete and some fragmentary, of the striped dolphin in American waters.¹

Records are listed in the following pages by locality, north to south, with the best published reference to each. The abbreviation (NS) identifies a record for which there is no specimen, or for which the specimen has been lost. The sex, when known, is stated.

Alaska.—*Valdez* (Swan Point); June 19, 1901; Andrew J. Stone Expedition; complete skeleton; AMNH 17948 (Allen, 1902, p. 218). *Montague Strait*, Prince William Sound; September 1905; J. Hobart Egbert; rostrum of skull and complete mandibles, in good condition; USNM 143140. *Sitka*; September 10, 1895; F. W. True and D. W. Prentiss; skull, lacking mandibles, and cervical vertebrae; picked up on beach; USNM 63299.

On three round trips aboard the MS *Black Douglas* from Seattle to the Aleutian Islands by way of the Inside Passage, Fish and Wildlife Service biologists, including the writer, saw no striped dolphins. Between November

¹ The museums designated in italics have specimens of *L. obliquidens*: Academy of Natural Sciences of Philadelphia, American Museum of Natural History, British Columbia Provincial Museum, British Columbia University, British Museum (Natural History), California Academy of Sciences, California Institute of Technology, California University Museum of Vertebrate Zoology, California University (Los Angeles) Department of Zoology Museum, Chicago Natural History Museum, Walter W. Dalquest Collection, Harvard Museum of Comparative Zoology, Los Angeles County Museum, Oregon State College Museum, Oregon University Museum, National Museum of Canada, Puget Sound College Museum, United States National Museum, Universidad Nacional Autónoma de México, and Washington State Museum.

27 and December 6, 1948, we crossed the North Pacific Ocean from Unalaska to San Francisco and saw no dolphins until we were within sight of the California coast. We have recorded *Phocoenoides* on at least a hundred occasions in Alaska, but never *Lagenorhynchus*. The latter is evidently uncommon in subarctic waters.

British Columbia.—Osgood (1901, p. 25) says that "a porpoise supposed to be of this species kept within a few feet alongside the schooner, for some time while we were sailing in Hecate Strait July 2."

Anderson (1947, p. 195) says that there are "no Canadian records available, but the species probably occurs on British Columbia coast."

Washington.—Cape Flattery ("just outside"), Clallam County; 1933 or 1934; Christian T. Larsen; photograph of harpooned specimen (NS); (Scheffer and Slipp, 1948, p. 271.) *Strait of Juan de Fuca* (off Race Rocks Light); September 17, 1936; Christian T. Larsen and John E. Guberlet; pregnant female (NS). I have a photograph of a fetus which Dr. Guberlet took from this specimen, although the fetus itself has been mislaid. (Scheffer and Slipp, 1948, pp. 271-272.) *Puget Sound*; catalogued March 3, 1857; George Suckley; rostral part of skull with about half of upper teeth; USNM no. 3123; (True, 1889, p. 98). *Cape Flattery* (35 miles south of), Clallam County; July 21, 1945; Victor B. Scheffer; juvenile male, skull and pelvic rudiments; USNM (BSC) no. 32316 X (Scheffer and Slipp, 1948, p. 273). *Oyuhut*, Grays Harbor County; November 2, 1944; collected by Paul M. Scheffer for Victor B. Scheffer; skull; USNM no. 274627; (Scheffer and Slipp, 1948, p. 273). *Grays Harbor* (50 miles west of), Grays Harbor County; August 17, 1939; Walter W. Dalquest; skull; WWD no. 1569; (Scheffer and Slipp, 1948, pp. 272-273). *Ocean Park*, Pacific County; May 3, 1942; Victor B. Scheffer; male skull nearly complete, with mandibles, braincase broken and restored; USNM no. 270980; (Scheffer and Slipp, 1948, p. 273). *Washington*; spring of 1945; Ole Kelvik on otter trawler *Mars*; vertebral skeleton, no skull; USNM no. 277547.

Oregon.—Locality ?; received November 26, 1901; George P. Bissell; skull lacking mandibles and most teeth; USNM no. 112987.

California.—*San Francisco* (near), San Mateo County; 3 specimens, the types, catalogued October 24, 1885; W. P. Trowbridge; skulls with mandibles in good condition; USNM nos. 1961, 1962, and 1963; (Poole and Schantz, 1942, p. 110). *San Francisco*, San Mateo County; catalogued December 11, 1874; C. M. Scammon; female, eyes, larynx, and genitalia in alcohol, USNM no. 12275. *San Francisco*, San Mateo County; catalogued December 11, 1874; C. M. Scammon; fetus in alcohol [possibly from no. 12275?]; USNM no. 12274. *Farallon Island* (10 miles south-southwest of), San Mateo County; December 12, 1948; Karl W. Kenyon and Victor B. Scheffer; female skull with mandibles, nearly complete, braincase shattered, pelvic rudiments; USNM no. 276395; also female fetus of same in alcohol; USNM no. 276353. *Monterey*, Monterey County; 2 specimens; November 20, 1872; complete skeleton of a female and a female skull only; collector's name and museum number, if any, not stated (NS); (Dall, 1874, p. 293). *Brighton Beach*, Santa Cruz County; 1931; H. F. Lorquin; weathered cranium picked up on beach; CUMVZ no. 51529; (Grinnell, 1933, p. 215). *Point Mugu* (near Hueneme), Ventura County; March 1931; Loye Miller no. 1184; "skeleton parts, skull, lower jaw"; CUDZM. *Point Mugu* (shellmound), Ventura County; February 1922; Dr. Van Bergen; a cranium assigned to *L. obliquidens*; LACM no. M 1120. *Point Vicente* (35 miles west of), Los Angeles County; April 19, 1919; Elmer Higgins; adult male (NS); (Higgins, 1919, p. 157). *San Pedro*, Los Angeles County; February 19, 1934; Dr. A. Elmer Belt; complete skeleton, mounted, LACM no. M 1194. *Hyperion Beach* (Los Angeles City sewer outfall), Los Angeles County; no date; Loye Miller no. 1440; nearly complete skeleton; CUDZM. *San Nicolas Island*; catalogued 1875; Paul Schumacher; skull, badly broken and restored, lacking mandibles and all teeth; USNM no. 15256. *Dana Point*, Orange County; skull in collection of Anita E. Daugherty, California State Fisheries Laboratory (letter of September 12, 1949). "*Off coast*"; November 27, 1874;

C. M. Scammon; juvenile skeleton, complete, on exhibition, USNM no. 14329; (True, 1889, pp. 97, 98, and 100). *California?* November 1, 1934; J. R. Pemberton; Loye Miller no. 1439; nearly complete skeleton of a female, taken from a fresh specimen on display in Bernstein's Fish Grotto, Los Angeles; said to have come via fishing boat from the California or Baja California coast; CUDZM.

On December 8, 1948, about 100 miles south of Monterey, we saw from the bow of the MS *Black Douglas* two dolphins, definitely not *Phocoenoides*, probably *Lagenorhynchus*. On the 12th, in 1200 fathoms of water, 10 miles south-southwest of Farallon Island, we saw about two dozen *Lagenorhynchus* and succeeded in harpooning one (as described above). On the 15th, in 1500 fathoms of water, about 40 miles off Eureka, three *Lagenorhynchus* cruised along the ship but did not approach close enough to be shot.

Baja California.—Tijuana (12 miles south of); June 30, 1925; G. Chittenden; "skull and jaw (broken)"; LACM no. M 544. *Ballenas Bay* (2 miles off shore, 18 miles south of the west end of Holcombe Island); October 8, 1939; J. F. Janssen; skull only; CUMVZ no. 95088. *Cape San Lucas* (north of Gorda Bank), Gulf of California; April 11, 1931. The skull was sent to Dr. Harold Heath at Hopkins Marine Station; present location unknown; photograph of freshly killed animal now owned by Anita E. Daugherty (letter of September 12, 1949).

Uncertain.—Dall (1874, p. 293) states that "one other skull is in Captain Scammon's possession, and one in the collection of the California Academy of Sciences." The first-mentioned was perhaps sent at a later date to the National Museum. The second was undoubtedly destroyed in the earthquake and fire of 1906. There are no specimens of *L. obliquidens* in the Academy collection now. Cope gives "the Bottle Nose Grampus" as the common name of *L. obliquidens* (In Scammon, 1869, p. 22). This is an obvious error, however, for farther along in the same article Scammon describes the color of the "Bottlenose Grampus" as uniform black (p. 54). True (1889, p. 97) lists an adult skeleton as USNM, no number.

True reexamined the type (a skull; USNM no. 3886) of *Delphinus longidens* Cope 1866 and concluded that it was "a small and youngish example of *L. obliquidens*" (1889, p. 99). Elliott (1901, p. 27) and Trouessart (1905, p. 510) followed his lead, but Miller (1924, p. 510) did not. The skull is now listed as *Stenella longidens* (Poole and Schantz, 1942, p. 113). "The allocation of this specimen to *Stenella* was made at my suggestion. The skull in question does not belong to the genus, *Delphinus*, but does represent a member of the genus, *Stenella*" (Remington Kellogg, in letter of June 25, 1949).

True likewise reexamined the type (a skull; BMNH no. 1509b); of *Clymenia similis* Gray 1868 and found that it could "not be distinguished from skulls of *L. obliquidens*" (1889, p. 99). Sclater (1901, vol. 2, p. 203) removed *similis* to *Lagenorhynchus obscurus* Gray 1846. According to Francis C. Fraser (letter of May 24, 1949) it is now listed in the British Museum as *Prodelphinus obscurus*. Fraser states also that "I think Kellogg in a tentative arrangement does include *obscurus* in the genus *Stenella*."

While the scope of the present paper is limited to North America, I should like to mention for the record five specimens, now deposited in American museums, which were collected in Japan.

All are skeletons taken at Aikawa Rikuzen by Roy Chapman Andrews in 1910, as follows: June 12, sex ?, HMCZ 11518; June 1, male, AMNH 31418; June 12, male, AMNH 31419; June 12, female, AMNH 31420; July 19, female, AMNH 31421.

The British Museum (Natural History) has a complete skeleton of *L. obliquidens* BMNH 1937.9.1.1, from Surugawa, Japan.

DESCRIPTION

Figures 1-3 show better than words can describe the color pattern of *L. obliquidens*. The colors are shades of white, gray, and black. The female porpoise illustrated by Scammon (1874, Pl. 19, Fig. 2) is similar in appear-

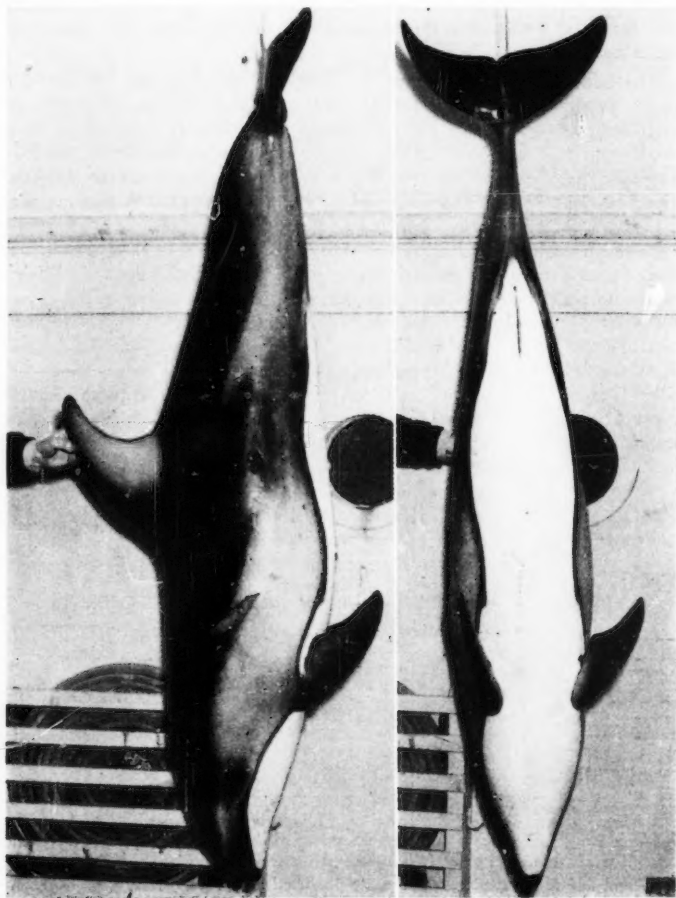


Fig. 1.—Striped dolphin. Adult female, left side and belly. Specimen USNM no. 276,395. (The body has been cut in several places by a harpoon and gaff hook.)

ance to the female which I photographed in California recently (Fig. 1) although in Scammon's animal the white expanse of the thorax seems to be abnormally constricted. Photographs by Okada and Hanaoka (1939, Text-fig. 1 and Pl. XII, Figs. 1-2) of one or more striped dolphins from Japan are very similar to ours.

True (1889, pp. 172-173, Pl. 27, Figs. 1 and 2) gave a synoptic description of *L. obliquidens* on the basis of all known information, including the original data of Dall and Scammon as well as his own findings. I do not think that it is worth while recounting True's synopsis here, since it is available to most of you.

The body measurements given by True for an adult, sex not recorded, were: "Total length 87 inches (221 cm); breadth of flukes, 24 inches (61 cm); extremity of snout to anterior edge of dorsal fin, 36 inches (91.4 cm)" (*op. cit.*, p. 173; from Dall, 1874, p. 293). These measurements stood for more than fifty years as the only authentic records of the size of the adult striped dolphin. There is, even now, only one complete set of measurements of a known-sex, adult *L. obliquidens* from American waters. This set applies to the pregnant female, USNM no. 276395 listed in Table 1. I should like, therefore, to present the measurements of this individual in detail: Weight 209 pounds; measurements, in millimeters: length, snout to base of tail notch, 1830; girth immediately behind flippers 1025; maximum width across tail flukes 550; snout to tip of dorsal fin 1180; length of beak (poorly defined) 40; extension of lower lip beyond upper 6; snout to insertion of flipper 483; axillary length of flipper 234; axial length of flipper 294; maximum width of flipper 114; height of dorsal fin 282; tail notch to center of anus 487; tail notch to center of umbilicus 984; length of anal-urigenital groove, pigmented part, 155; distance between mammary slits 39; corner of mouth to snout 229;

TABLE 1.—Body length of *Lagenorhynchus obliquidens*, adult specimens from the North American coast.¹

Specimen no.	Body length as recorded	Body length in mm.	Sex	Collector
—2	7½ feet ?	2286	male	Higgins
—	87 inches	2210	?	Scammon? 3
CMVZ 95088	195 cm	1950	?	Janssen
USNM 276395	1830 mm	1830	female ⁴	Kenyon and Scheffer
—	about 6 feet ?	1828	?	Larson
—	about 6 feet ?	1828	female ⁴	Larson and Guberlet
USNM 274627	6 feet	1828	?	Scheffer
USNM 270980	1797 mm	1797	male	Scheffer

¹ Measured straight from the snout to the base of the tail notch. The method of measuring is not known for a specimen whose recorded length is followed by a question mark. The specimens are more fully described under Distribution, pp. 750-752.

² "probably of the species *Lagenorhynchus obliquidens*" (Higgins, 1919, p. 157).

³ Dall, 1874, p. 293.

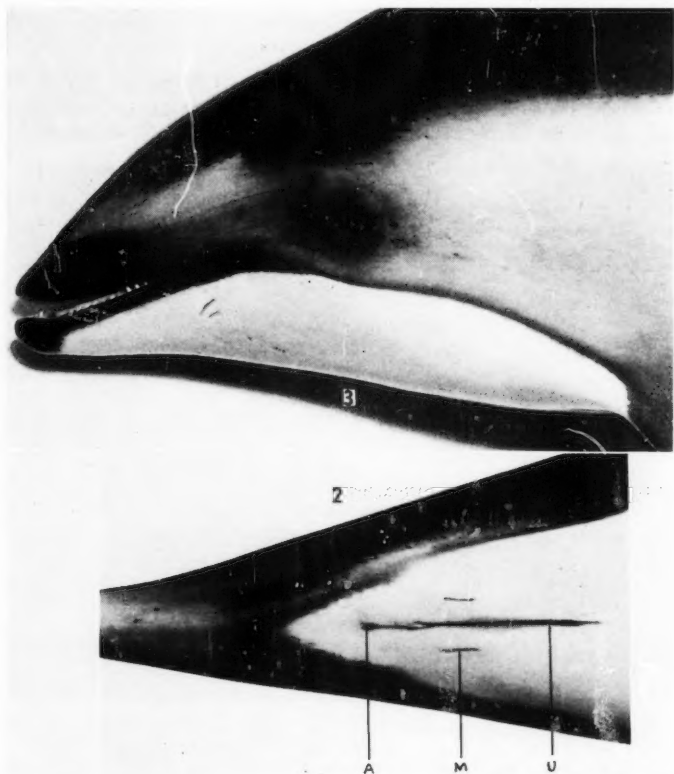
⁴ Pregnant.

snout to center of eye 274; dimensions of eye opening 10 by 22; snout to transverse slit of blowhole 297; maximum transverse width of blowhole 29.

The teeth are round in cross-section, slender, sharp, and curved inward. They number, in the cleaned skull: 29 in each half of each upper jaw, 31 in the lower right jaw and 32 in the lower left; total 121. Kenyon and I had counted 111 visible teeth in the freshly killed specimen.)

According to Kellogg (1940, p. 82) the males of the Atlantic species *L. acutus* are slightly longer than the females.

The data presented in our Table 1 and the Table 1 of Oka'da and Hanao-



Figs. 2, 3. Striped dolphin.—2. Adult female showing anus, mammary slit, and urinogenital slit. Specimen USNM no. 276,395; 3. Adult female showing details of head. Specimen USNM no. 276,395.

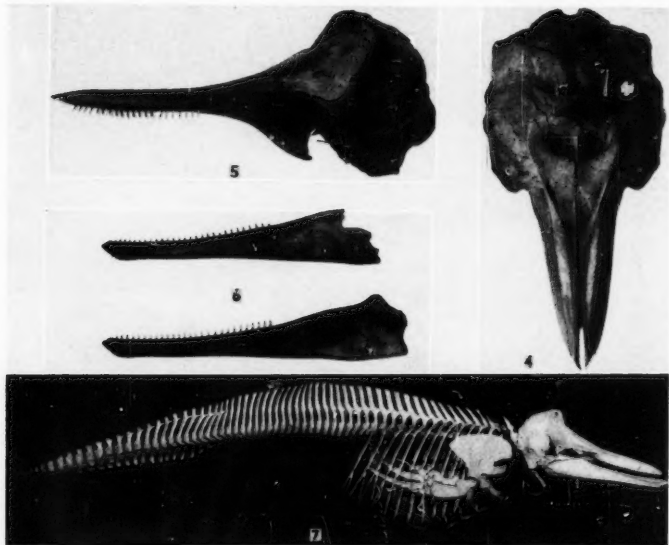
ka (1939, p. 141) are inadequate to show sex disparity in *L. obliquidens*, if it exists. The longest female on record measured 6.0 feet, the longest male 6.4 feet. Scammon's specimen of unknown sex measured 7.2 feet. Higgin's male was reported to be $7\frac{1}{2}$ feet long, although there is some uncertainty both as to the identity of the species and the way it was measured.

FOOD

Scammon says only that the striped dolphin feeds on small fish near shore (1874, p. 98).

Higgins found that, in a California specimen, "the cardiac stomach contained six recently swallowed sardines of unusually large size—about one foot in length. In addition, the stomach contained about a pint of partially digested material and a quantity of fish scales" (1919, p. 157).

The stomach of the recent California specimen, USNM no. 276395, has kindly been examined by Charles C. Sperry. It contained the beaks of 29 small squids and the pens of 2 large squids. [The pen is the chitinous, flat,



Figs. 4-7. Striped dolphin.—4. Adult male, dorsal aspect of cranium. Specimen USNM no. 270,980; 5. Adult male, left aspect of cranium. Specimen USNM no. 270,980; 6. Adult male, (above) outer aspect of left mandible, (below) inner aspect of right mandible. Specimen USNM no. 270,980; 7. Skeleton from San Pedro, California, exhibited in Los Angeles County Museum no. M 1194; total length from tip of mandible to tip of caudal vertebra 1,648 mm. (6.4 feet). (Photo by courtesy of Kenneth E. Stager).

elongated, plate known also as the gladius, which serves as the internal skeleton.]

REPRODUCTION

From the evidence of three specimens, mating probably occurs in summer and the young one is born in the following spring or summer.

On September 17, 1936, Dr. John E. Guberlet collected a "22 mm. embryo" (crown-rump length 12.9 mm.) in the Strait of Juan de Fuca, Washington (Guberlet, 1936, p. 56; Scheffer and Slipp, 1948, p. 272).

On December 12, 1948, Kenyon and I collected a female fetus, length 370 mm.; weight 960 g. (2.11 pounds); 10 miles south-southwest of Farallon Island, California. The fetus was resting with its back against the mother's belly, head pointed toward the mother's head.

On July 21, 1945, I collected a suckling young male, length 1,240 mm.; weight 65 pounds; 35 miles south of Cape Flattery, Washington (Scheffer and Slipp, 1948, p. 273).

David H. Johnson wrote in a letter of April 18, 1949, that a fetal *Lagenorhynchus* collected by C. M. Scammon at San Francisco, California, has been preserved in alcohol as USNM no. 12274, catalogued December 11, 1874. There are no accompanying data.

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Notes and Discussion

Notes on the Distribution of the Frogs and Toads of Kentucky

For the past several years I have collected frogs and toads in Kentucky as the opportunity arose. As I am no longer actively collecting in the state, and will be unable to prepare a more comprehensive report, as was the original objective, this paper is prepared as an aid to those actively working the state, with no effort to include previously published records.* In one or two instances, I have previously published a short note based on certain of these specimens.

Every species listed is represented in the writer's personal collection, but some of the county records are based on voice records; in every case, however, these voice records are clearly specified as such, and are listed for what they are worth.

Scaphiopus h. holbrookii (Harlan).—My only specimens of this species are from Floyd's Station and Hadley, Warren County. There are valid records of the spadefoot from eastern Kentucky, but I have never seen or heard one there.

Bufo a. americanus Holbrook.—I have taken this species at Floyd's Station and at Hadley, Warren County; Bowen, Powell County; and on Black Mountain, Harlan County. In most sections of the state, the American toad is considerably less abundant than Fowler's toad. There appear to be no records of this species west of Warren County.

Bufo woodhousii fowleri (Hinckley).—My collection contains specimens from Hadley and Bowling Green, Warren County; Science Hill, Pulaski County; Bowen, Powell County; Clay Village, Shelby County; Murray, Calloway County; and Black Mountain, Harlan County. This species is apparently common throughout the state.

Acris gryllus crepitans Baird.—I have collected this species from Science Hill, Pulaski County; Farmers, Rowan County; and Alvaton, Warren County. During the latter part of April and early May, 1941, choruses of this species were often heard in the vicinity of Brodhead, Rockcastle County. In late May, 1948, a chorus was noted at Fullerton, Greenup County. No specimens were collected from either of these two counties. It appears that this species is absent from the southeastern section of the state. Intensive collecting in Harlan County failed to yield a single specimen; furthermore, there appear to be no records from the most westerly section of the state.

Pseudacris brachyphona (Cope).—I have specimens from Morehead and Elliottville, Rowan County, and Black Mountain, Harlan County. This species is common in the mountainous sections of eastern Kentucky, where it apparently replaces the following form.

Pseudacris nigrita triseriata (Wied.).—I have collected this species from Somerset, Pulaski County, and Floyd's Station, Warren County. Choruses of this species have been heard in 1942 at the following locations: Gradyville, Adair County, March 17; Jones-Keeney Game Refuge, Caldwell County, March 19; Taylor's Store, Baker's Cross Roads, and Tobacco, Calloway County, March 19; Mannington, Christian County, March 19; Dawson Springs, Hopkins County, March 19; Edmonton and Gascon, Metcalfe County, March 16; Hardin, Marshall County, February 23; Paducah, McCracken County, February 23; Russell Springs, Russell County, March 16; Eggner's Ferry, Trigg County, March 19; and near Brodhead, Rockcastle County, April 10.

This species is abundant in central and western Kentucky, but appears to be generally absent from the mountainous regions of eastern Kentucky, as well as the most northerly section of the state.

Hyla c. crucifer Wied.—I have specimens from Murray, Calloway County; Somerset, Pulaski County; Gates and Farmers, Rowan County; and Black Mountain, Harlan County. Voice records are from: Jones-Keeney Game Refuge, Caldwell County; Gascon, Metcalfe County; McHenry, Ohio County; and near Brodhead, Rockcastle County. This species is apparently distributed throughout the state.

Hyla squirella Latreille.—I have taken this species at Hematite Lake, Kentucky

* Since the above was written circumstances have changed so that I will be able to prepare a comprehensive report as originally planned.

Woodlands National Wildlife Refuge, Trigg County; and Murray, Calloway County. There are apparently no other locality records of this species in the state.

Hyla v. versicolor (LeConte).—This species is represented by specimens from the following localities: Lynch and Cumberland, Harlan County; Science Hill, Pulaski County; Morehead and Farmers, Rowan County; Bowling Green, Floyd's Station, and Hadley, Warren County. This species is apparently distributed throughout the state.

Rana areolata circulosa Davis.—As far as I am aware, there are no previously published records of this species in the state, although the western end of the state is included in range maps of this species. My only specimen is one picked up in a residential section of Paducah, McCracken County, in early April, 1942.

Rana catesbeiana Shaw.—I have specimens of this species from the following localities: Murray, Calloway County; Cumberland, Harlan County; Science Hill, Pulaski County; Farmers, Rowan County; and Hadley, Warren County. There are voice and sight records of the bullfrog from many other counties; undoubtedly this species occurs in every county of the state.

Rana clamitans Latreille.—This species is represented by specimens from Cumberland, Harlan County; Science Hill, Pulaski County; Farmers, Rowan County; and Clay Village, Shelby County. Probably this species occurs throughout the state.

Rana palustris LeConte.—I have specimens from Morehead and Gates, Rowan County; and Floyd's Station, Warren County, and have collected specimens (subsequently lost) from Black Mountain and Ross Point, Harlan County. This species is apparently distributed throughout the state.

Rana pipiens sphenoccephala (Cope).—I have collected this species from Murray, Calloway County; Science Hill and Somerset, Pulaski County; and Morehead, Rowan County, and observed it in Fleming and Trigg Counties. This frog is apparently distributed throughout the state.

Rana s. sylvatica LeConte.—I have specimens from Carter Caves, Carter County, and Black Mountain, Harlan County. The distribution of this species in the state appears to be quite spotty.

Microhyala carolinensis (Holbrook).—My only specimens of this species are from Science Hill, Pulaski County, and Floyd's Station, Warren County. This species likewise appears to be rather spotty in distribution, and confined to the south-central portion of the state.—ROGER W. BARBOUR, Oglebay Institute, Wheeling, West Virginia.

A New Distribution Record for *Beckmannia erucaeformis* (L.)

On a botanical trip during the summer of 1950 through the northern part of the lower peninsula of Michigan I happened upon a small colony of *Beckmannia erucaeformis* (L.) Host, in a shallow, wet ditch along Highway 23 about three miles north of Pinconning, Bay County. Gray gives the range of the plant as Minnesota, Iowa and westward; Britton and Brown as western Ontario to Alaska, south to Iowa and California. The Michigan floras at hand do not list it. The specimen (No. 217196) is deposited in the Nieuwland Herbarium at the University of Notre Dame.—P. E. HEBERT, C.S.C., University of Notre Dame, Notre Dame, Indiana.

Note on the Distribution of the "Plume Poppy"

On several occasions in the past year, the plume poppy, *Macleaya cordata* (Willd.) R. Br., has been collected or its presence reported by different persons in the Chicago area. The largest number of specimens reported, 12 in all, was found in a waste place near the Immaculate Conception High School Campus, Cook Co., Chicago Illinois on July 24, 1949. The plants seen, 4 feet or more in height, were sturdy specimens and all in full bloom. A specimen (No. 213580) has been deposited in the Herbarium of the University of Notre Dame. It is presumed that the plants escaped from cultivation and it is thought that this eastern Asiatic species is spreading slowly from cultivation to fields or to disturbed areas along roadsides.—A. L. DELISLE, University of Notre Dame, Notre Dame, Indiana.

BOOK REVIEWS

FIELD MANUAL OF PLANT ECOLOGY. By Frank C. Gates. McGraw-Hill Book Company, Inc., New York. 1949. 137 pages, 17 figs. \$3.00.

This is the first general field manual for plant ecology that has appeared in almost a quarter of a century (*Research Methods in Ecology*—F. E. Clements, 1905; *Aims and Methods in the Study of Vegetation*—G. A. Tansley and T. F. Chipp, 1926). Dr. Gates' thirty-two summers experience at a biological field station particularly qualifies him to write such a manual and he has done a very good job. In the preface are listed eleven of the leading books on ecology. The student is referred to the bibliography in the back of these books for further references, thus eliminating the necessity of an exhaustive bibliography in the back of the manual.

The introduction explains the purpose of the manual, the uses of the exercises, incidental equipment, and suggested remedies for field annoyances such as, sunburns, poison ivy, bee stings, snake-bites, etc.

The context of the book consists of sixty exercises, well distributed over the field of plant ecology. This number permits an ample selection which, with slight modification for local conditions, makes the book flexible enough for use in any general plant ecology field course. The exercises are clearly and concisely written and require only the less complex instruments in their execution. A list of required instruments is included in the back of the book.

The only criticism is that the exercises are more or less mechanical and stimulate but little reasoning. This, however, can be remedied by supplemental problems and questions by the instructor.—H. I. FEATHERLY, Department of Botany and Plant Pathology, Oklahoma Agricultural and Mechanical College, Stillwater.

VETERINARY PROTOZOLOGY. By Banner Bill Morgan and Philip A. Hawkins. Burgess Publishing Co., Minneapolis. 1948. vii+195. \$4.00.

As stated in the preface: "During the past several years of teaching Protozoology and Parasitology, the writers have felt the need of a handbook for veterinary students, practicing veterinarians, and agricultural students.

"The present book is an attempt to fulfill this need. The volume gives a brief description of the protozoan parasites of domestic animals and the diseases they cause. It is intended as a practical treatise with emphasis on morphology, life histories, pathology, diagnosis, treatment, and control of parasitic protozoa which occur in the domestic animals of North America. It may also be helpful to protozoologists, zoologists, biologists, parasitologists and public health workers."

The introductory chapter (I) gives a key to the classes of Protozoa and brief discussions of morphology, physiology, history of veterinary protozoology, types of protozoan parasites, host specificity, pathology produced by protozoan parasites, spread of parasites, classification, and a list of Protozoa of veterinary importance. This is followed by chapters on the Protozoa of the Horse (II), of Cattle (III), of Sheep and Goats (IV), of Swine (V), of the Dog and Cat (VI), of Poultry (VII), and of Fur Bearers (VIII). The last chapter (XI) deals with the Diagnosis of Protozoan Infections. There is an appendix dealing in turn with nomenclature, lists of parasites for the different hosts, treatment schedules, lists of books and other publications of veterinary interest, a bibliography of 209 titles and an index.

There are about 130 stylized line and stipple drawings of Protozoa which are well suited to offset reproduction but are sometimes too diagrammatic. There are, in addition, a photographic frontispiece, three distribution maps, illustrations of equipment used for the diagnosis of bovine trichomoniasis, and a chart showing a breeding program for the control of venereal trichomoniasis.

As is often the case with first editions there are some typographical errors, a few mis-

statements, and ungrammatical sentences, which will doubtless be corrected in later editions.

Altogether the volume represents a very praiseworthy effort to fill the need for a treatise on Protozoa of veterinary importance.—D. H. WENRICH, University of Pennsylvania, Philadelphia.

THE FIG. By Ira J. Condit. Chronica Botanica Co., Waltham, Mass. 1948. 222 pages, 27 illustr. \$5.00.

Dr. Condit's book, the most inclusive work on the fig, embraces every conceivable aspect of that important tropical and subtropical fruit: the history of fig culture, the significance of the fig in literature and mythology, its morphology, taxonomy and nomenclature, breeding, propagation, physiology and biochemistry, pathology, culture, marketing, and commercial products. This volume encompasses a wealth of research and cultural information heretofore available only in papers published by many investigators in many journals, and thus constitutes a valuable compendium and source book. In the preparation of his volume, Dr. Condit has not followed the primrose path of simply listing investigators and summarizing their contributions, but has written a well-organized running account into which the most significant research results have been woven. Some 650 research papers are cited and their contributions described and evaluated.

The discrimination employed in the writing of this work has been of such quality that the volume has almost equal appeal to botanists, horticulturists, practical plant growers, and food technologists. The accuracy of Dr. Condit's botanical and horticultural material is unquestioned, and the detailed discussion of the processing and utilization of figs is both modern and thorough.

Especially interesting is Dr. Condit's detailed account of the history of caprifigation, of the early controversies concerning this phenomenon, and of the introduction of *Blastophaga* into the United States.

Dr. Condit's book is in the tradition of the best 19th century books on natural history in its breadth and depth and its careful writing, and sets a modern pattern for similar works on other crops. It is to be hoped that the Chronica Botanica Company may sponsor similar volumes on bananas, citrus fruits, beverage plants, and other important crops of great botanical and practical interest.—HARRY J. FULLER, University of Illinois, Urbana.

ANATOMY OF THE DICOTYLEDONS. By C. R. Metcalfe and L. Chalk. Oxford University Press, Amen House, London E.C. 4. 1950. lxiv+1500 pp. Illus. 2 vol. £6.6s. net.

The purpose of this reference book is to provide a summary of the anatomy of the vegetative organs of the Dicotyledons. Its major emphasis is directed toward the taxonomic and phylogenetic phases of histology but ecological and developmental anatomy have not been neglected. It combines the knowledge of the general systematic anatomist with that of the specialist in wood structure to form a valuable reference compendium for both anatomist and taxonomist.

Dr. Metcalfe, in charge of the Jodrell Laboratory, Royal Botanic Gardens, Kew, and Dr. Chalk of the Imperial Forestry Institute, Oxford, were well equipped to attempt a revision and extension of Solereder's monumental *Systematic Anatomy of the Dicotyledons*. The senior author, a leader in the field of plant anatomy, has the great collections at Kew at his disposal and it was here that Boodle in 1908 made the original translation of Solereder's work. Dr. Chalk, a recognized authority in wood anatomy and past Secretary of the International Association of Wood Anatomists, has an outstanding wood and slide collection at the Imperial Forestry Institute. Dr. M. M. Chattaway collected data for the genera in Yale School of Forestry collections that were not represented at Oxford.

The description of each family includes a general summary and a brief summary of the wood anatomy. This is followed by a detailed description of the leaf and the axis. The description of the axis is complete for herbaceous plants, or deals first with small

stems in the case of woody plants. Small stems include the first few seasons growth or such as are found on herbarium sheets. The mature wood is described separately, as are roots and anomalous structure when information is available. Notes on the taxonomic conclusions of anatomists are given. A brief discussion of economic uses makes up an unexpected and valuable section. A list of references to general anatomy and to wood structure are appended to each family description.

Those who have had occasion to use Solereder will appreciate the more concise treatment and orderly arrangement of this new work. The data in Solereder were used and to these were added information from a great many original observations and literature compilations. Thus many gaps have been filled and the information presented in much more readily accessible form.

In the end of the text are a considerable number of lists of families in which diagnostic features occur. Examples of these lists are various kinds of plant hairs, leaf epidermis, hypodermis, stomata, veins, and petiole; stem cork, primary rays, anomalous structure, and crystals; secretory structures; and, a number of special features of secondary wood anatomy. Several lists show the noteworthy geographical distributions of families and finally the woody or herbaceous characteristics of the families are given. In the appendix are tables showing the number and percentage of species having vessels, fibers, and rays of various size classes and having varying numbers or rays per unit area or width. These lists and tables will prove useful to support generalizations and for certain investigative work. Most of them can be used to narrow the field in connection with difficult problems of identification.

The scope of their work may be judged to some extent by the authors' bibliography. Nearly all of the references prior to 1908 were omitted because they are available in Solereder's book. Those listed in this work number 2535. These are cited throughout the text. Without doubt this will be the standard reference work on the anatomy of the dicotyledons for many years. It is an essential reference for plant anatomists, wood anatomists, and taxonomic botanists. It will be a valuable reference for others in various fields of investigative or economic botany.—ROBERT W. HESS, Yale School of Forestry, New Haven, Conn.

THE SMITHSONIAN INSTITUTION—AMERICA'S TREASURE HOUSE. By Webster P. True. Sheridan House, New York City. 1950. 306 pages, illustrated. \$3.50.

The story of the Smithsonian Institution—how it came into being, what it is, and what it has done—has just been told by Webster P. True, until a few months ago the chief of its Editorial Division, in his book, *The Smithsonian—America's Treasure House*. Such a book could be dreary reading, for in part it has to be in the nature of a catalog of objects, but Mr. True has carefully and cleverly given his readers a sufficient number of "breathing spaces" so that the book holds the reader's interest from beginning to end. These "breathing spaces" are usually digressions telling the stories of why the objects are treasured or how the Smithsonian came into possession of them. Once through with the collections the way is easier, for the stories behind most research problems are fascinating.

The book opens, as might be guessed, with the story of James Smithson and his magnificent gift to the American people. "For the increase and diffusion of knowledge among men,"—these were the words in Smithson's will that indicated how his gift of a half-million dollars was to be used. There were no other strings to the gift! However, there would be no Smithsonian Institution today if Smithson's nephew had left an heir. Smithson died in 1829, the nephew died unmarried and childless in 1835, and the estate was settled in the English courts by 1838. Eight years later the Smithsonian Institution was founded in Washington.

The Smithsonian is an independent office of the United States and has administrative control over various bureaus: the United States National Museum, the National Air Museum, the Astrophysical Observatory, the Bureau of American Ethnology, the Freer Art Gallery, the National Zoological Park, the Canal Zone Biological Area, and the International Exchange Service. The National Gallery of Art, often but erroneously called the Mellon Gallery, is also under the Smithsonian but with its own board of trustees, of

which the Secretary of the Smithsonian is one. Some of these bureaus are mainly engaged in the diffusion of knowledge through exhibits and publications, others mainly in the increase of knowledge through research programs. Mr. True has dealt with all of them in a very understanding and sympathetic manner. His selection of illustrations for the book is excellent—with so many subjects to choose from it must have been very difficult to decide what not to use. Sheridan House has done a good job with the letterpress and binding, though the treatment of the illustrations could have been better. The book is recommended without reservation to all who have an interest in our most important scientific institution. It is a good book in all its parts.—EDWARD A. CHAPIN, U. S. National Museum, Washington, D. C.

NATURALISTS OF THE FRONTIER. By Samuel Wood Geiser. Southern Methodist University Press, Dallas, Texas. 1948. 2nd. edition. 296 pages, frontispiece. \$5.00.

In this account of early naturalists of Texas Dr. Geiser has selected eleven men for some detailed consideration. These eleven were not necessarily the most outstanding or productive of scientific workers in the Southwest, but rather represent a cross section of the various types who spent varying portions of their lives investigating the natural history of the region. Many other naturalists traversed the area contemporaneously, 1820 to 1880, with those included in the core of this volume. The men who were intent on the study of science in this frontier region were of diverse origin, coming from distant countries of Europe as well as from the east coast of the young United States. Of the many early workers of this period Geiser has selected Jacob Boll, Jean Louis Berlandier, Thomas Drummond, John James Audubon, Louis Ervendberg, Ferdinand Lindheimer, Ferdinand Roemer, Charles Wright, Gideon Lincecum, Julien Reverchon, and Gustaf Belfrage.

The frontier of the Southwest was not only a geographic one during the early nineteenth century, but a social and political one as well. It was the period of Texas wars with Mexico, the establishment of the Texan republic and the statehood of Texas. The early years covered by the book coincide with the great cholera epidemic and the middle years with the war between the states. In a country being colonized and developed along with these other disrupting conditions, the naturalist had to work in an extremely hazardous environment. Privations were many, settlers were unfriendly and suspicious of scientists, and there were still Indian troubles. Many of these early workers who were far separated from their friends and supporters consequently came to have a feeling of being abandoned when the means for provisions and equipment were slow in forthcoming and meager in amount. They often worked in a physical and psychologic turmoil, and it is truly amazing that they accomplished such an enormous amount. Some were considered failures at their task, but whether the men themselves were incompetent or were forced into failure by the prevailing conditions is debatable.

In the first chapter the background for the compilation of biographies is given. Each of the following eleven chapters is devoted to a particular naturalist. These chapters include not only the scientific doings of the personage, but something of his early life, other activities, and an interesting composite discussion of the man's entire life as an individual. To lend further background and understanding of the naturalists of the Southwest, the author concludes with a chapter called "Notes on Scientists of the First Frontier." This gives a brief resumé of the earlier scientists and conditions of the Carolinas, Kentucky, Tennessee, and the Midwest. Appendix A provides a list of source material upon which each of the chapters is based. Appendix B presents very brief biographical data on 153 naturalists and collectors who worked in Texas in the period from 1820 to 1880. A final appendix lists 82 of the author's publications on the history of science in early Texas.

Dr. Geiser has presented a readable, interesting, and highly informative account of the early naturalists of the Southwest. The bookmaking is well done.—R. L. LIVEZEY, University of Notre Dame, Notre Dame, Indiana.

MAMMALS OF LAKE TAHOE. By Robert T. Orr. California Academy of Sciences, San Francisco. 1948. 127 pp., illus. \$4.00.

Dr. Orr has presented in this little volume an interesting account of the mammals of a well-known resort area. The work is intended primarily for the layman who may visit Lake Tahoe and vicinity, but is useful as a quick reference by the student of natural history. Accounts of the mammals found in this region of the Sierra Nevada are brief, but accurate, and very well written. The uninitiated is not encumbered by much technical jargon and is left free from unnecessary discussions of subspecies variability. As the author states (p. 120), "Throughout this book I have purposely refrained from any consideration of the subspecies involved in the case of geographically variable mammals."

A short history and a description, both geologic and floral, of the region serve to orient the reader in the background of this part of the Sierras. These chapters are followed by one on the classification of mammals, strictly for the non-biologist, and then a good key to the species discussed in the book. By far the major portion of the volume is taken up by the species accounts. Included in the fifty-three species are five insectivores, five bats, fifteen carnivores, twenty-two rodents, five lagomorphs, and one artiodactyl. In these accounts there is given a very brief, but adequate, description of the animal, its general and local distribution, and a more lengthy discussion of the habits. This last portion contains the core of information and has new data scattered through it.

At the end of the book there is a short glossary and a list of twenty-three references pertinent to the mammals covered in the book. The very good illustrations, depicting the animals in their natural settings, were done by George and Patricia Mattson. A topographic map on the back fly-leaf and cover is of aid in locating the local distributions of the forms. The price may limit the general purchase of the book, but it should be favorably received by vacationists in the Tahoe area.—R. L. LIVEZEY, University of Notre Dame, Notre Dame, Indiana.

THE MAMMALS OF VIRGINIA. By John Wendell Bailey. Published by the author, 27 Willway Rd., Richmond, Va. Williams Printing Co., Richmond, Va. 1946. xvi+416 pp., 96 figs. \$5.00.

This book of eighteen chapters includes mammalian characteristics, history of Virginia mammalogy, geologic history of mammals, fossil mammals from Virginia, habits and habitats, economics, conservation, classification, identification, type localities, a list of mammals by groups, a classified list, keys, an account of the recent mammals of Virginia, gestation period of certain mammals, bibliography, and index. The bibliography of 768 titles goes through the year 1944, but very few are more recent than 1936. By no means are all of the titles quoted in the book and a number are done so erroneously.

Inclusion of such things as a list of white and negro populations by counties, game bird propagation, and irrelevant quotations seems superfluous. Together these items make up quite a number of pages and add nothing of value to the book. There is much repetition of information, as evidenced by chapter 15 which includes the material of chapters 11 through 13. The habits of subspecies of a given species are repeated, rather than bringing the forms together under the species and pointing out the minor differences that might occur. The author states that the arrangement of recent mammals is based on Miller's 1923 check list, but has modified this former work to suit himself.

It appears to the reviewer that Bailey has overemphasized the domestic mammals in proportion to the non-domestic. For example the puma is allotted one and a half pages and the lynx two pages, while the domestic cat receives four pages; twenty pages are devoted to pigs, cattle, horses, and mules while the rest of the present-day Virginia mammals of these orders are allowed eleven pages. The bison, last reported from the state in 1797, is given ten pages. There are quite a number of errors incorporated into the work. To cite only a very few, *Rattus* and *Mus* are given as having a gestation period of 25 days, the young of the red squirrel are said to be born in May or June and the mother cares for them until late summer or early fall, the number of teeth are always constant for a species, *Blarina* and *Microtus* have similar nests, *Crotalus atrox* is

given as the name of the timber rattlesnake, the opossum places her newborn young in the pouch, and raccoons "wash their food before eating it whenever possible."

The volume contains numerous typographical errors. The half-tones in many instances are not clearly reproduced nor at times well chosen. There is a triple index, one to English names and general topics, one to fossils, and an index to scientific names. The latter is not subheaded.—R. L. LIVEZEY, University of Notre Dame, Notre Dame, Indiana.

ISLAND LIFE: A STUDY OF THE LAND VERTEBRATES OF THE ISLANDS OF EASTERN LAKE MICHIGAN. By Robert T. Hatt, Josselyn Van Tyne, Laurence C. Stuart, Clifford H. Pope, and Arnold B. Grobman. Cranbrook Institute of Science. Bulletin No. 27. 1948. xi+179 pp., 43 figs. \$4.00.

During the years 1937 to 1944 studies were made on fourteen islands of north eastern Lake Michigan. The purpose was to determine the geographic and ecologic distribution of the vertebrate inhabitants of these islands, learn how the species reached the islands, and what factors restricted their distribution. This very fine volume is the result of these studies.

In all, eleven persons participated in the work which was carried on jointly by the Cranbrook Institute and the University of Michigan. With the exception of the chapter on "The Birds," which was written by Van Tyne, Dr. Hatt was responsible for the compiling, synthesizing, and editing of the report. Each of the other authors has reviewed, not only the section of his specialty, but the general sections as well. Data for the compilation of the book come not only from the actual studies by members of the field parties, but also from all previously published literature pertaining to the islands and from personal communications with other biologists.

From the biologist's viewpoint the late and post glacial geologic history of these islands is the important phase. The larger islands emerged from glacial lake Algonquin. Following this the water dropped as much as 200 feet below the present lake level, thus connecting all islands except one (South Fox) with the mainland. Islands were then restored by a gradual rise in water level owing to tilting in the north during formation of glacial lake Nipissing. The importance of the "land bridges," formed during the lowered lake level, in populating the islands is difficult to evaluate, for as is stated, "nothing at all is known of the faunas of this area during that time and one must seek evidence for such dry-land distribution in the record of present distributions."

The cultural history is discussed and the islands are described individually. These two companion chapters make evident man's influence on the distribution and success of the species encountered or that have been exterminated in recent years. Man's affect has proven both detrimental and beneficial to the faunas of the islands. Farming, lumbering, hunting, and other commercial enterprises have modified the habitats and caused extirpation of several species. On the other hand, old sawdust piles, buildings, and fields have become shelters and advantageous habitats, thus increasing the populations of some species.

The three chapters covering the amphibians and reptiles, birds, and mammals are primarily annotated lists of the species found. These include 30 amphibian, 8 reptilian, 152 avian, and 28 mammalian species. In addition, there are contained in these chapters many interesting data on distribution, differentiation, modification of habits, and the like. In all instances the species represent depauperated mainland faunas. As would be expected, the birds have had the greatest success in reaching and maintaining themselves on the islands, the amphibians and reptiles are next in order, and oddly, the mammals have had the least success despite the year round activity of many and the attending ice bridges during the winter.

A very short, but interesting chapter, and one that might have received more attention, is that on modification of habits. We find that under the insular conditions imposed on the animals they may be quite adaptive, so as to not only exist, but reproduce in habitats unlike those with which we normally associate the species. To mention a few, *Hyla crucifer* "on the North Fox Island had no possible breeding places except the shal-

low water between shore boulders, in water continuous with, and not more than 10 feet from, the open water of Lake Michigan." Great blue herons were found nesting not only in trees considerably above the ground, but other nests were near the ground, and in one case "on Pismire Island where there was but a single nest and but one tree, the nest was on the ground." "A pair of duck hawks was found nesting directly on the ground on the side of a sand dune on South Fox Island." Meadow voles overran the forests, woodland deer mice were abundant in beach drift, and "Towhees lived deep in the big hardwood forest."

The final chapter of the book, "Factors of Distribution," summarizes and correlates the findings. Although the authors do not propose any definite conclusions, in lieu of more ample data, some aspects seem fairly clear. Most of the animals apparently reached the islands by air, water, and ice. Those forms that arrived by these media are discussed as well as the failure to invade by other forms that might logically be expected to do so. Driftwood and other detritus seem to be very important factors in transporting some species from the mainland to the islands. Diversity of the island faunas is correlated more closely to the ecological diversity than to absolute area of the separate islands. But, the lack of certain species on some of the smaller islands is found to be the result of absolute area necessary to support a population. Faunal affinities favor the Lower Peninsula of Michigan as the primary source of origin of the islands' populations.

A list of the vertebrate faunas arranged by islands is a useful appendix to the volume. Here, as in the annotated lists, records are indicated as being by specimen, voice, sign, nest, observed, acceptable report by others, uncertain record, and introduced by man.

In appearance, the book is attractive, the typographical errors are at a minimum, the half-tone reproductions are clear, and the general arrangement is pleasing. That the red squirrel "has become a distinct species" (p. 125) on Isle Royale is an overstatement. Other than this the shortcomings are few and need not be noted. This book will prove useful, not only to those who have opportunity to study these islands, but to anyone interested in animal distribution and should provide a stimulus for more work of this nature.—R. L. LIVEZEY, University of Notre Dame, Notre Dame, Indiana.

AN INTRODUCTION TO NEMATOLOGY. Section I, Anatomy. By B. G. Chitwood and M. B. Chitwood with contributions by R. O. Christenson, J. Jacobs and F. G. Wallace. Privately published by B. G. Chitwood, Catholic University of America, Washington, D. C. Revised 1950. viii+213 pp.; 145 (multiple) figs. \$10 cloth bound.

The vast literature on the Nematoda is so bulky, so scattered and so diverse in point of view that all students of helminthology were gratified when the Chitwoods began to issue their *Introduction to Nematology* in 1937. The medical and veterinary aspects of the field had been pretty well summarized in the several text books and at least two books embodying diverse points of view on the taxonomy of the group had made their appearance. However, comprehensive zoological considerations of the Nematoda has never been generally available until the Chitwoods launched their program of publication of an *Introduction*. As originally planned, the work was to consist of ten numbers of several chapters each.

With only five of the numbers or parts issued up to the time of the World War II, the program of publication was interrupted. The authors decided to revise and reprint the material, the initial volume of which is here offered as Section I, Parts I to III.

The new edition includes considerably expanded treatment of the taxonomy, especially of the plant parasites. The class Nematoda has been elevated to rank of a phylum and many others of the groupings have been stepped up a notch in the scale of classification. Uniform endings for all names within the same taxonomic category in the groups above the rank of family were introduced in the first edition, but lack of general acceptance of this system leaves the authors confronted by the realization that wholesale changes might become extremely involved. Without any direct commitment, the authors state that "Such changes, if any, will be made when the Systematic Section is published. In the meantime, alterations are held to a minimum."

In many of the sections, new materials have been added to include results of studies made since the first edition was published. A greatly expanded outline of the Classification of the Nematoda is placed at the close of Chapter II instead of following Chapter IV as in the original arrangement. The name of each category above the rank of family appears in the heading along with the taxonomic name. The descriptions for most of the groups are much more incisive than in the first edition, including details of morphology, life histories and host relationships.

There is no general index, only the illustrations are indexed. For locating materials in the text, the reader must rely wholly upon the four-page table of contents. Zoologists in many different fields will find this volume helpful and will be looking forward to the appearance of additional parts of the *Introduction to Nematology*.—HARLEY J. VAN Cleave, University of Illinois, Urbana.

THE HUMAN BODY AND ITS FUNCTIONS. By C. H. Best and N. B. Taylor. Henry Holt and Company, New York City, N. Y. 1948. Revised Edition. xi+500 pp., 8 plates, 278 figs. \$3.60.

In this elementary textbook all aspects of human physiology, with the noticeable exception of that of muscle, have been well presented. The few references to muscle physiology are scattered and must be considered inadequate. The incorporation of additional material on this subject would have enhanced the value of this book.

The authors write in a very lucid manner. The size of the type used and the spacing of the lines facilitate rapid reading. Italicized words are used to call attention to important structures and functions. Footnotes are frequently employed to clarify statements or to introduce advanced material.

The text is amply illustrated. Most of the illustrations are of excellent quality and have been wisely selected. A few, however, might have been greatly improved had the authors carefully examined a textbook of general zoology. Plate IVb depicts frog erythrocytes as being circular in outline. Comparison of fish, frog, bird, and rabbit brains are made in fig. 32.2. The "fish" brain is obviously that of a frog while the "frog" brain bears but little resemblance to that of any vertebrate. According to fig. 42.4, rats receiving daily injections of the growth hormone grow *less* rapidly than controls. Spindle fibers are omitted from the late prophase and the daughter cells lack centrioles (fig. 44.8).

Although the physiology presented is, for the most part, quite accurate there are a few statements which are certain to lead the reader to develop wrong impressions. A statement contained in a footnote (p. 36) might easily be construed to infer that some of the "lower" vertebrates possess enucleate erythrocytes. The reviewer would appreciate some experimental proof in support of the assertion (p. 234) that it is possible for a man to live and actually do work when the ambient temperature is 250° F. The authors fail to mention either the type of work that can be done or the duration of such extreme exposure. The statements on p. 265 are contradictory. The first (true) attributes the formation of nails, claws, etc. to the epidermis. The succeeding sentence informs us that the dermis is responsible for the development of these structures. The fibers of the optic tract (p. 270) are wrongly called dendrons. The sheath of Schwann (p. 271) is incorrectly identified as the myelin sheath. Spermatozoa are called single-celled organisms (p. 440). The concluding statement of the text (p. 482) infers that it is necessary to resort to the theory of acquired characters in order to explain certain types of inheritance. This should be supported by references to the work of reputable investigators.

A pronouncing glossary is included. This would be more useful had definitions been added. It is to be noted that the pronunciation of many words are not in agreement with Webster's unabridged dictionary.—ARTHUR L. SCHIPPER, University of Notre Dame, Notre Dame, Indiana.

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